BEEKEEPING FOR THE BLIND

by

Harry W. Newman

Seth W. Hoard

and

Henry S. Wodtke

Monograph Number 11

The New York Institute for the
Education of the Blind Series

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PREFACE

This monograph BEEKEEPING FOR THE BLIND is one of a series of educational publications of The New York Institute for the Education of the Blind. From time to time during the past years, the staff of the Institute has published monographs dealing with professional problems in the field of the education of the blind. This manual was begun several years ago, but because of the absence of many instructors from the staff of the school during the period when World War II was in progress, and more recently the serious illness and death of Mr. Harry W. Newman, who had devoted himself during his later years to a professional study of beekeeping and its application to the blind, this monograph has been unduly delayed. It is now presented to the professional field as a contribution on this subject.

The Institute is indebted to Mrs. Harry W. Newman, the widow of Mr. Newman, for the use of portions of the manuscript and the drawings found in the text. Mr. Henry S. Wodtke, Chief Engineer of the Institute, who worked very closely over the years with Mr. Newman, has collaborated with Mr. Seth W. Hoard of the Institute staff in editing the material. We are grateful to these two individuals for their interest and contribution. We are also appreciative of the most effective cooperation and practical help which the Institute has received during the past years from the Bronx Beekeepers Association.

M. E. FRAMPTON, *Principal*

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INTRODUCTION

This work is a manual of beekeeping prepared by the late Harry W. Newman for the instruction and enjoyment of the pupils of The New York Institute for the Education of the Blind. Mr. Newman, a retired engineer who was himself seriously handicapped, was intensely interested in beekeeping and wished to impart this enthusiasm to his young blind friends at the Institute. Unfortunately, Mr. Newman died before his projects could be carried out as fully as he had desired. This manual is being published as a tribute to Mr. Newman and his sincere interest in the cause of the Blind.

Beekeeping is no new field for the Blind. The man who first studied the bee scientifically and who ranks with Linnaeus, Humboldt and other naturalists of the eighteenth century was blind from the age of fifteen. He was a Swiss and his name was Francois Huber. His published works are models of scientific observation and deduction. John Bernard Mannix in his book, "Heroes of the Darkness," 1) quotes Maurice Maeterlinck's tribute to Huber: "His (i.e. Huber's) 'New Observations On Bees' . . . have remained the unfailing, abundant treasure-house into which every subsequent writer has dipped; . . . there is not a single one of his statements that has been disproved, or discovered in error; and in our actual experience they stand untouched, and indeed at its very foundation."

It is fascinating to read in "Observations sur les Abeilles" 2) how Huber discovered the way in which the fecundation of the queen bee is performed and how the previous theories of Swammerdam, Reamur and De Braw were discredited. 3)

Huber did not work alone. He relied for his observations on the keen eyes of an intelligent servant and friend, Francis Burnens. By skilful and merciless questioning Huber directed his helper's attention

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1) J. B. Mannix, "Heroes of the Darkness." Partridge, London. No Date.

2) English translation by C. P. Dadant, "Huber's Observations On Bees," American Bee Journal, Hamilton, Illinois, 1926.

3) Dadant, op. cit. pages 9 and 10.

to significant details. Burnens was enthusiastic about the work and spared no pains to collect the information which the blind naturalist desired. In the "Observations" 1) Huber records his mistakes as well as his triumphs so that men may know how much repetition and defeat is necessary in order to prove conclusively a scientific theory. Huber and Burens by their joint efforts discovered the genesis of the swarm, the fact that workers are undeveloped females, that the queen develops by special feeding, how beeswax is produced, how the sensory apparatus of the bee functions, and in fact all that we know about the habits of these wonderful insects.

From the work accomplished by Huber it is evident that beekeeping is one of the many hobbies that can be pursued successfully by blind people. Anyone living in the suburbs of a city or in small town as well as in the country can make beekeeping a fascinating pastime and a source of income. Of course there are some phases of beekeeping that require the use of vision, and the blind man will have to rely on members of his family or friends who are interested in beekeeping to guarantee the survival of the swarms. On the other hand there are many processes which he can perform himself without help.

Mr. Harris Turner of the Canadian National Institute of the Blind, in an article on Harold Webb, 1) blind beekeeper of Alandale, near Toronto, has outlined the processes which require sighted help and those which the blind beekeeper can perform successfully himself.

Sighted aid is needed

1) To select the queen bee
2) To eliminate weakened colonies
3) To establish new colonies
4) To detect and eradicate certain pests and diseases

The blind beekeeper can perform the following operations without sighted aid:

1) Operate the steam plant
2) Take honey from the hives
3) Load frames on truck
4) Set up fresh frames

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1) Harris Turner, "Fifteen Million Assistants." Outlook for the Blind, Vol. XXIX, No. 5, Dec. 1935, page 198.

5) Operate the extracting machinery
6) Wash vats and tubs
7) Erect new hives

From this list it is obvious that the number of processes in beekeeping which a blind man can perform by himself will depend on his mechanical ability and on his enthusiasm and interest in the work. The construction and maintenance of the hives require a certain handiness with tools and a knowledge of carpentry. If the blind beekeeper is clever with tools he can do some of the work on the hives for sighted beekeepers in exchange for aid in processes where vision is required. However, if the blind beekeeper does not wish to construct the frames and hives and prefers to pay for assistance in some other way besides carpentry, hives and frames may be purchased from mail order houses or from other companies. They are easily assembled according to the directions that are sent with them.

Beekeeping offers the blind man a means of participating in a branch of scientific farming, a chance to form social and business contacts which will be a source of pleasure and profit to him. The blind man who takes up this hobby should become a member of the local Beekeepers Association and thus assure himself of professional aid and advice when special problems arise.

Mr. Newman's text has been slightly modified to conform with some of the limitations mentioned above.

FUNDAMENTALS OF BEEKEEPING

(Adapted for the use of the Blind)

BEEKEEPING FOR THE BLIND

CHAPTER I

The Development of the Modern Hive

The natural habitat of the honey bee is any sheltered, convenient place where, secure from the inclemencies of the weather, such as a recess in a building, or hollow tree, the economy of the hive can be located. Enough space is needed for the drawn comb to be attached, and sufficient cells for the queen to keep the colony developing, and to sustain the progeny and maintain enough storage of honey to feed throughout the cold winter, until the following season, when the spring brings forth the flowers to supply the nectar for the baby bees, which will be emerging when the warm season returns.

It is curious indeed, what strange places bees will sometimes choose. I was sent some years ago to locate a swarm of bees on a piece of waste ground and found the swarm occupying an empty five gallon tin can. It was quite convenient for me to take them from this hive and install them into a regular hive. Bees are not always so considerate, for generally they will select the most inaccessable places, such as buildings, entering through a knothole and building their hive between the studding. Bees often settle in attics where they become quite a nuisance. It seems this has always been their natural trend and it was left for man to exploit their use and to induce them to work along more suitable lines.

Now, before we begin to talk about bees, let us consider the hive. As I feel assured, it is most essential one should be perfectly conversant with the good and bad qualities that go toward hive building. It is true the modern beekeeper has little need to go very far in this direction for the most of his beekeeping. It is remarkable how little the average person knows about honey and beekeeping in this country. The yield of honey in 1942, which was not the best of years as far as a good honey harvest is concerned, was over 400,000,000 pounds or 200,000 tons. That year the Southern beekeepers and queen breeders shipped over 410 tons of package bees from the south to the northern beekeepers.

Once the American people can become educated to the use of honey in place of processed sugar, they will be much benefited. Honey is nature's natural sweet and comparable with the modern processed sugar more healthful in every respect. As is well known, artificial processing of any food destroys its natural food values.

Honey, both as a medicine and food, should be found in the homes of all looking forward to good health and happiness.

Beekeeping as a hobby is one of the most interesting one can have. Except on some rare occasions feeding is unnecessary as they obtain their food from the surrounding country, the only expense involved being the tools and equipment. Apicultude is wonderful also in its educational value — to learn what can be done and produced by these little insects. The joy and satisfaction that comes from properly understanding the bees is a hobby worthwhile. This is perhaps generally sufficient. However, I feel confident you will be a better beekeeper if you will acquaint yourself with the whys and wherefores of certain hives, their advantages and disadvantages, the kind of hive best suited to your particular location, whether you wish to produce comb or extracted honey.

The history and development of the modern hive is very interesting and gives us a good understanding of the splendid characters among the pioneers of beekeeping, the difficulties they found and overcame, their courage and honesty; in fact, I believe these first students of apiculture were noble, upright, and sincere men of thought, — such men as Huber, Langstroth, Quimby, Gallum, Heddon, and Danzenbaker. These men worked along different lines but with one aim paramount in their minds — to get the best results they were working for. It is a long way from the old-fashioned step to the modern hive and we owe a debt of gratitude to past beekeepers for solving so many of these difficulties for us. I suggest if possible you read the subject of hives in Root's A.B.C. 1) It will repay you and help to an appreciation of the subject under consideration.

It is well that we understand what the principles were that these pioneers were striving for; they undoubtedly were trying to work in cooperation with the natural instincts of the bees, having in mind the general pattern or construction of the hive if left to themselves. The combs built in a hollow tree, or any other convenient place, will always run true to type as far as comb building is concerned, but what the beekeeper is desirous of is to have combs in frames easy and convenient to handle.

After many years of experimenting it is obvious that the standard hive of eight or ten frames, consisting of the regular Hoffman style, 17⅛" x 9⅝", is the most satisfactory. There is something to be said in favor of larger hives and deeper frames as a preventative of swarming. However, these frames are so heavy to handle when full of brood and honey and are not interchangeable with the regular full depth supers that it makes their use a drawback. Also it is often necessary to change frames from one hive body to another, especially when one wishes to Demaree his colony to prevent swarming in the two months generally chosen, May and June. I suggest you make up your mind as to which hive you consider best and then stick to it. It is a nuisance to have a lot of

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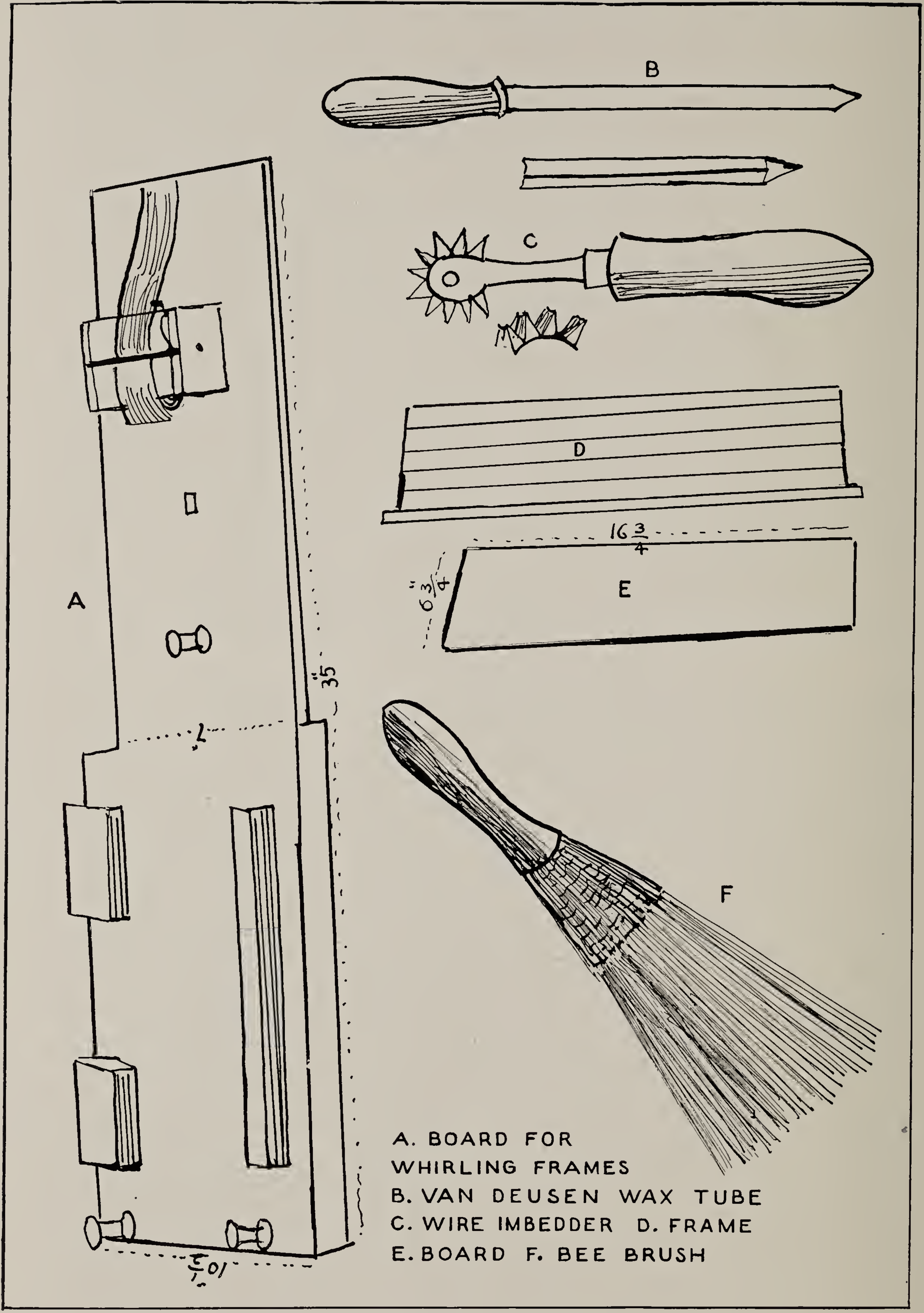
1) The A. B. C. of Bee Culture, by A. I. Root, The A. I. Root Co., Medina, Ohio.

equipment around that will only fit one kind of hive. My own choice after nearly forty years of expxerience is the standard eight frame hive with two full depths for brood rearing. I find a good vigorous queen can maintain these sixteen frames; or if a ten frame hive, a full depth body and a shallow which about equals the former. Having decided the hive to work with, the next consideration is whether to purchase your hive from the supply store or make the hive yourself. Of course, there may not be much, if any, saving in the cost but if you are limited as to time it will be better to buy. The stock generally supplied by the equipment firms is good and reliable but if you are handy with tools there is nothing to prevent you from making the hives yourself. The main thing is to get a good grade of lumber. Straight pine, of course, is best, but second grade, well selected with but a few small knots which can be coated with shellac before painting I find satisfactory. Let us assume then that you have decided to construct your own hives. Purchase your lumber. If for ten frame hives, it will require a six foot board ¾″ x 10″. The outside measurement of a ten frame hive is 16″ x 20″ x 9¾′. The size of the eight frame hive is 14″ x 20″ and proportionately shorter. The depth of shallow will be 5¾″ for the ten frame hive. I believe you will find it more convenient to use all full depth supers unless, of course, if the weight is too heavy. The weight of an eight frame hive when completely full will be a little over fifty pounds. The ten frame hive will be about twelve pounds more. A Hoffman frame, well filled with honey, contains about six pounds of honey plus wax.

Now, as to the tools necessary: A cross cut saw, a square, a rabbet plane. Lay the lumber on the work bench. Then, measuring, cut two sticks ¼ x ¾ - 16″ x 20″ for the ten frame hive, or 14″ x 20″ for the eight frame hive. Now, if you are going to dovetail the hive together, I suggest you make a template with the dovetails cut — one made with tin is suitable — then with a scratch gauge, mark off the width or thickness of the wood on all ends. Then mark on your template the right and left for the sides as it is only necessary to reverse to obtain the corresponding end. Then when you know that all the hives are cut accurately you know they will tier evenly. When you have both sides marked, place the two sides, one on top evenly and drive a brad (1½″) on either end to hold the two securely together. Then with your square strike a line across both boards and with a straight back saw, cut the tails out, reverse, and cut the other end also. Now with a sharp chisel, cut the uncut portion along the scratch line, separate the boards by drawing the brads before using the chisel. When the tails on the sides are neatly cut, place the end piece in the vise and with a pointed pencil mark off the tails by placing the side on top. Then use the square to mark where to cut. Be careful to mark accurately. Leave the pencil line to make a snug fit. Now chisel the corresponding pieces off, leaving only the tails which, if properly cut, should fit tightly. Be careful to even the side and end when marking so as to be sure they rest squarely on top of each other. Also cut the rabbet on the ends before fitting



A. BOARD FOR
WHIRLING FRAMES
B. VAN DEUSEN WAX TUBE
C. WIRE IMBEDDER D. FRAME
E. BOARD F. BEE BRUSH

together. Set the plane to cut ½″ deep and wide enough to allow space for the hive tool to move the frames when removing for examining, etc. If you wish to place tin in the rabbet, cut strips of tin an inch wide, double over one side the width of rabbet and nail. This helps to make it easier as there is less propolis to gum the ends of frames. If the dovetailing is a little over your head, the hives can be put together very satisfactorily with nails or screws. 3″ brads or 2″ flat head screws. Drill and counter sink for the screws as a precaution against splitting the wood. Of course you will allow the thickness ¾″ both sides of ends or 1½″ less for ends than you would for the dovetailing job. Now you can make the bottom board similar to the regular style, or a plain board the width of the hive, nailed together with a couple of cleats and about four inches longer only in this case you notch the entrance 10″ or 12″ x ¾″. In the warm season when the hive is strong and needs more ventilation, take a piece of wood 1″ x ¾″ and cut diagonally one inch to nothing. These strips can be inserted under each side of the hive, raised by the hive tool and affords easy access for the bees and plenty of ventilation. In the Fall these same can be taken out and stored for the following summer. The advantage of this entrance is it is simple to adjust and prevents skunks from clawing into the frames. The width of entrance also can be extended or constructed with small pieces of wood as required. The shallow hives can be made same as the full depths only of course the difference in width is generally 5¾″. The inner cover is a plain ½″ board with a ⅜ cleat x ¾″ or 1″ nailed to one side to flush with sides and ends, holding the ½″ pieces tightly together. A hole in the center for the Porter Bee Escape completes the inner cover. The telescope cover is made from 3¾″ stock, allowing ⅛″ play all around. Cover this frame with ½″ lumber and tin. Tin being difficult to obtain, you may use duck, canvass or rubberized cloth and paint. Paint all the hive outside with two coats of white paint, touch over all knot holes with shellac, if any, before painting and after one coat, stop all nail or screw holes with putty. The frames for bee hives can be bought and are much cheaper, being made by machine, than self made. These can be purchased from the bee supply houses and come furnished with nails and instructions for assembly. Also instructions come with the wiring outfit. This wiring gadget can be fastened to a board and when needed can be nailed temporarily to the work bench. The same board can be used for wiring full depth or shallow frames, it being necessary only to drive a six-penny nail ½″ wider than the bottom slot and pulling over nail to hold snug for wiring. The wax foundation comes in several thicknesses,— light, medium and three ply, the last being the strongest. The light is used generally for comb honey production. The medium can be used very successfully for both brood rearing and extraction, only be sure the foundation is firmly embedded by the wire so that the combs will be drawn straight and evenly, making it less difficult for handling when working the hives. The three ply is very good also for extracting frames as they can stand more rough handling and as these frames can be used year after year, the extra cost is well repaid. It will generally be found that among the frames drawn from foundation, many are what may be termed perfect. That is, the cells will be all worker type and finished down and attached to the bottom bar. These are splendid frames to substitute for poorer ones when required for the brood nest as the less drone cells permitted in the brood hive, the stronger the hive will be, as it should be, with worker bees.

Please remember the drones are very lusty eaters and consume about four or five times as much as the worker bees. Hence, the less drones, the better for honey production. As stated, the directions come with frames, wiring and foundation wax, so carefully follow these for best results.

CHAPTER II

Stands — Location For Hives — Enemeies

Hives purchased from the supply houses have stands for the support of the hives, but the objection to these stands is that being on the ground they are more subject to rot. Also grass and weeds are liable to block the entrance, and so impede the bees in their entrance to and from the hive.

The stand which I believe, all things considered, to be a good one is made in the following way. Get some old one inch pipe. The stands can be made any length to suit; for instance if you wish a stand for four hives, cut the following pieces of pipe to these lengths:

Four pieces — 24 inches
Two pieces — 36 inches
Six pieces — 12 inches

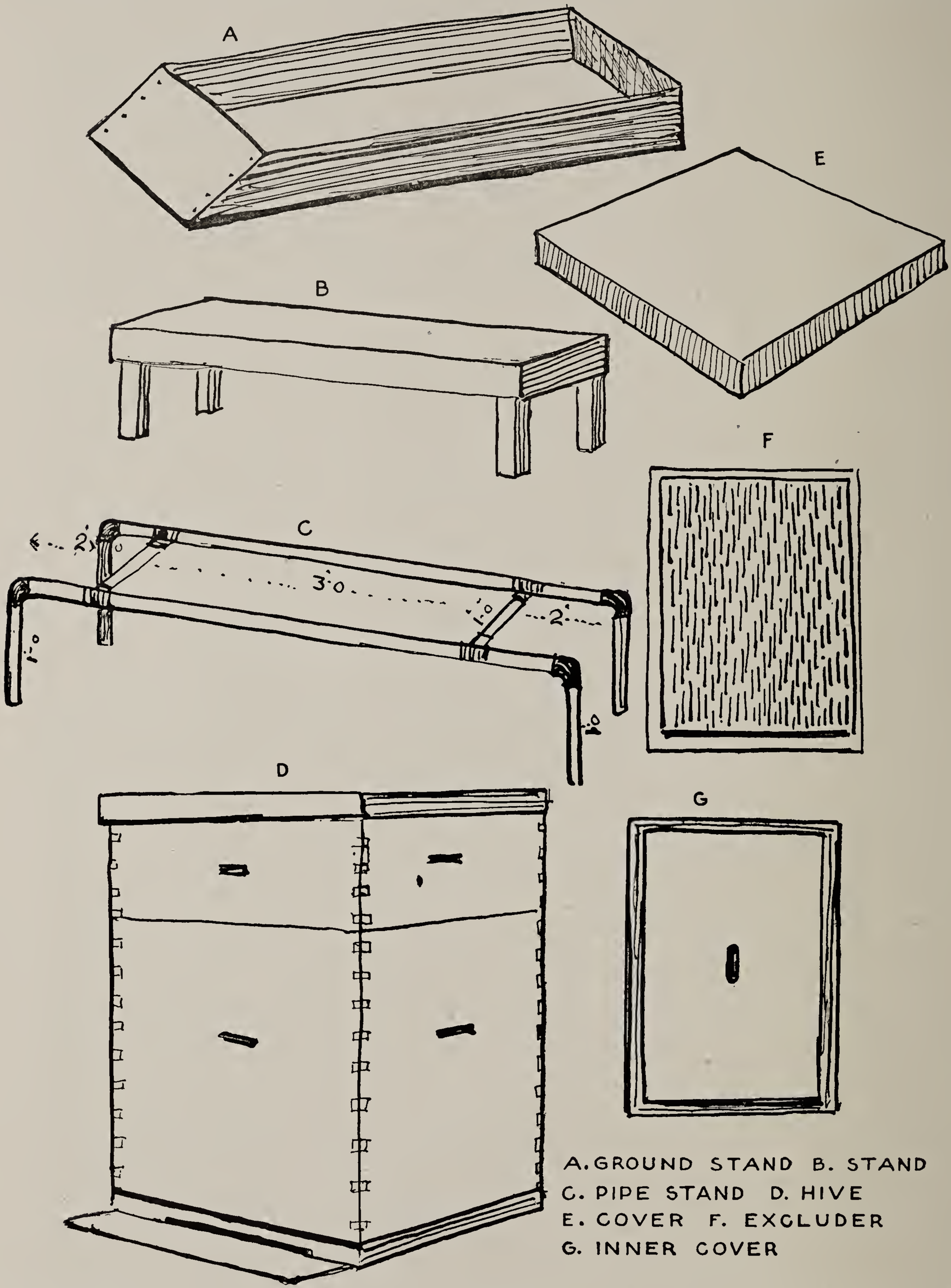
All pieces to be threaded both ends except the four 12 inch pieces used as supports, as these are only threaded on one end. In addition to the pipe you will need four T's and four L's. First connect the two foot pieces to the 3 foot piece, next the two foot piece — you now have the length. Next a foot piece as cross piece, then the two foot pieces, the other three foot piece follows. These are all connected with the first side, the only difficulty you will have, is in connecting one of the one foot cross-pieces. The trick to doing this is simply to cut the thread twice, the length on one end, take it up tight then in unthreading, connect with the beginning of the T and this will lock both sides together. The remaining four one foot pieces used for the support, are screwed tightly into the L's. These supports placed on either a flat stone or brick will make a secure stand. A little cement packed around the base of these supports will give added security. Another advantage of this stand is that it can be placed on uneven ground and it is only necessary to cut the length of leg supports as required.

In setting up the stand place your level so as to be sure the hives will rest in their proper position. If the front of the hive is about a half inch lower than the back it will be all right, as this slight slant will shed rain or snow later. With the stand about a foot from the ground it is more convenient to handle the frames and it is also handy if you wish to rest a frame between the sides against the other hives. If the supers should be too heavy, simply put a support under the center. I have had my hives six full depths and have not found it necessary to do this but you may be in a better honey location, where it may not be unusual to have three or four hundred pounds of surplus honey. In this case brace up your hives.

When hives are placed on the ground there is danger that they may be infested with ants. The blind man should have some one with sight select a place that is free of ant hills. These pest sare a continual nuisance to the bees and keep the guard bees busy. The ants also effect the disposition of the bees. The bees becoming quite vicious at times, especially when there is a dearth of nectar in the fields. A stand neatly painted white, the hives painted the same color, maks a nice appearance and are an ornament to the apiary.

Again the skunks, I mean the four footed variety, are not able to bother the bees, because they cannot climb, but if the hives are on the ground and the entrance to the hive being at its summer opening, the skunk will lay in front of the hive and reach his paws into the hive and feast on the honey to his heart's content. The bees can't seem to dent his armour for he simply shuts his eyes and goes to work until satisfied. So if the hive is not secured to the bottom board it is liable to push the hive over. If troubled with skunks in your locality I suggest you construct a figure four trap, and catch these marauders for once they get a taste of honey, they know a good thing and they will repeat their visits. Of course a steel trap placed in front of the hive will do the trick also.

Beside skunks the bees have other enemies. Of course some birds take their toll of bees. The thrush, cat-bird and a few others but the worst bird is the king-bird. This bird will perch on the pole or some other suitable place and catch the bees as they are winging their way homewards full of nectar, and just eat the juicy part of the bee and leave the shells of the bees at his look-out post. He is entitled to a few bees, for he is a fine help to the farmer in destroying many other insect pests. But if he becomes too much of a nuisance, take some very small gravel stones in a sling-shot, a few well placed will drive him to another location. The dragon fly in the evening is apt to get a few bees but this is not serious. The worst enemies of our bees are the two foul broods. One known as American foul brood, Bacillus larvae and European foul brood, Bacillus pluton. American



A. GROUND STAND B. STAND
C. PIPE STAND D. HIVE
E. COVER F. EXCLUDER
G. INNER COVER

foul brood, the worst enemy of the bee is caused by a micro-organism known as Bacillus larvae and European foul brood is caused by another nucro-organism known as Bacillus pluton. The cause of a hive becoming infected is that some of the organisms causing it are carried into the hive from the diseased colony or by infected honey found by the bees in some other place. This bacillus affects the intestinal tract of the bee, and when fed to the developing insect destroys the life and causes the young form to degenerate into a stringy gelatinous mass, dark brown in color and possessing a very disagreeable odor not unlike fish-glue. One of the first indications of this disease that will be noticed is an occasional sunken and discolored capping of sealed brood. These cappings are generally found with a very small opening. On opening such cells a dead pupa will be found. If any such cells should appear, one should at once suspect American foulbrood.

The best remedy for American foulbrood is to destroy the bees. This can be best done by closing the entrance to the hive, and pouring about two ounces of carbon bisulphide in and on the top and then closing the top tightly. This is a heavier than air gas and soon destroys the bees. As a warning when suing this, it being ver yinflammable, keep away from all fire or lights, etc. If there is honey in the frames this honey can be used for the table, as this disease is harmless to humans, then the frame and all other frames burned. The inside of the hive bodies can be scorched with a torch, and scraped with the hive toop — also the inside of all the other parts of the hive, although this may seem like a drastic measure to take, but from my experience I suggest it is the best. I have had some success with shaking the bees in front of the hive, burning the old frames, and starting the bees on new foundation wax, but when you think that you have made a good job of it, the trouble is liable to appear again, often a year or two later. My friend, A. C. Gould, the New York State inspector, tells me it does not pay to bother trying this method, as it is a waste of time. When the hive has been properly cleaned, replace with new frames and foundation. Insert a new package of bees with a queen, or introduce a new swarm. If placed on new foundation they will need to be fed for a few weeks, until strong enough with nectar and pollen, for the feeding of the baby bees. Any tools and clothing must be thoroughly cleaned, as the spores of this disease are very hard to destroy. For instance, boiling for two hours will not kill completely, and spores contained in honey have been found active after forty years by the Cornell University. As I stated, this is the chief enemy of the honey bee.

European foulbrood on the other hand is not so dangerous, and can be cleaned out much easier. The first thing is to kill the old queen and later give a ripe queen cell — a cell not capped — or a young laying queen. This interval from killing the old queen until the introducing of another queen, or queen cell, should be about ten to twenty-five days, which will give the hive workers an opportunity to clean out the dead larvae and polish the cell again before the brood is again reared in them.

I also suggest if possible the introduction of a strong, young, Italian queen bee. This procedure usually cleans up any European foulbrood. If these measures have been taken there is little chance of this disease appearing again.

As a precaution, I advise anyone to be careful in purchasing bees, to assure themselves that they are of a good strain and are free from any disease, as this will save much trouble later on, for once American foulbrood finds its way into an apiary it becomes a difficult matter to eradicate. For when one hive becomes affected it soon spreads until all are contaminated.

I recall on one occasion, when inspecting an apiary, every hive was found to be infected and I was forced to condemn all seven hives of this apiary. I felt the deepest sympathy for the poor old beekeeper, for these bees were one of the joys of his life.

It is well to understand the symptoms of these diseases and how to remedy the trouble before it gets too strongly established in the apiary.

Make a careful examination of the hives and also try to learn if hives in the surrounding neighborhood are free from disease. If you are unable to determine whether your bees are infected, take a small portion of the comb, or smear a little of the diseased matter on a piece of thick paper to mail to Washington. Address it to Bureau of Agriculture, Agriculture Department, Washington, D. C. and they will give you the results of their findings.

CHAPTER III

Bees — Various Kinds. The Three Sexes of Bees — Queen — Worker — Drone. The Morale of the Hive. Comb Making. The Cells of Different Kinds of Bees. The Queen — the Chief Factor of the Hive. Obtaining Good Strains. Producing Strong Colonies.

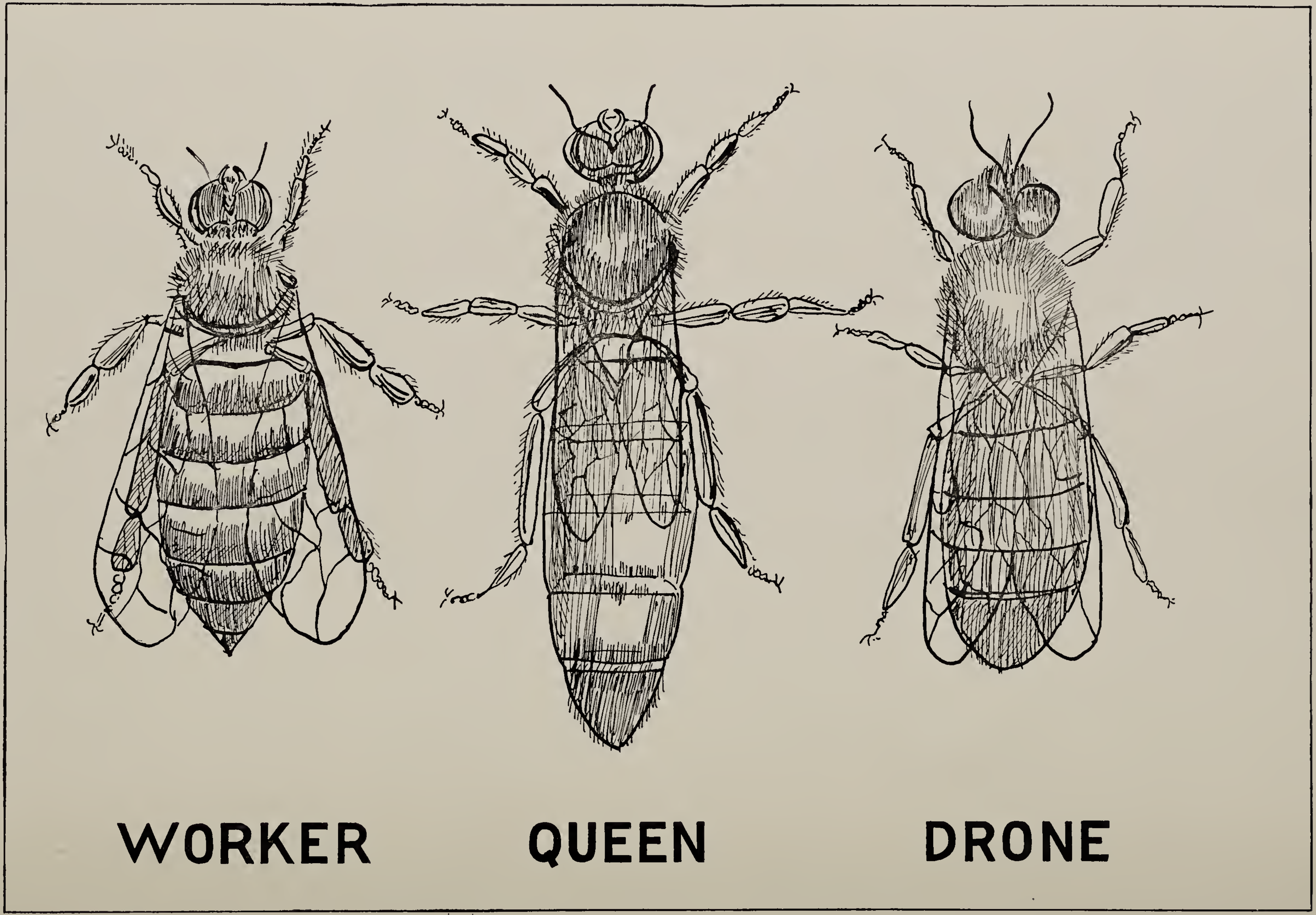
To classify the honey bee briefly we find it to belong to the animal kingdom — sub-kingdom. Arthropods (Class Hexapoda or Insecta), Order-Hymenoptera. Family-Apidae. Genus-Apis. Species Mellifica. The scientific name of the honey bee is thus: Apis mellifica. There are many races or varieties of the honey bee: German or black, Italian, Carniolan, Caucasian, Cyperan, Syrian, Holy Land and others.

In this country the most common is the black or German bee. This strain is rarely found in its purity for the reason that Italian blood has been repeatedly crossed upon it. Italians are today the improved bees of this country: Carniolans, Caucasians are favored by some beekeepers. But from experience it has been found that Italian bees are more resistant to European foulbrood than other strains. They build more brace combs and use more propolis than the German or Carmiolan bees. The yellow or Italian queens are more easily found because of their color and their quiet way of walking about the comb. German bees are harder to handle. They are irritable and often run off the combs and out of the hive. They make a whiter and more beautiful section of honey than the Italian bees, since they leave a small air space between the wax and the honey. Where the honey and wax come in contact with each other the comb is said to be "watery" in appearance which is often the case with honey produced by Italian bees. Carniolan bees are stronger and more vigorous than most other races but swarm excessively so that they often gather less honey than the Germans or Italian bees. The Cyprian bees also swarm excessively and are vicious and difficult to handle. Smoke seems to irritate them instead of quieting them. Italian bees were first imported from Italy about 1860 and since then have spread throughout the entire country. In contrast with the common black bees, they are of a decided yellow color and show from two to five yellow bands. There are many strains of Italians offered for sale today by the various breeders. That some of the bees are better than others there can be no doubt. That some are decidedly vicious and some more gentle there is no doubt, but which is best would be hard to say. The only way to find which is best for your own conditions is to buy queens for your colonies from several of the most reliable and careful breeders and then weed out all but the best stock. Do not keep vicious bees — there are others equally good which are gentle. Do not keep bees for their color alone — pretty bees are not always the best workers; although the two can often be combined. Keep bees which produce honey.

Bees live together in colonies consisting of many thousand workers, a few hundred drones and one queen. Although these types have distinctive characteristics they cannot be recognized by sence of touch alone. Therefore any process which involves distinguishing the different types of bees will require sighted aid.

The queen is a fully developed female, capable of laying eggs which produce either drones or workers. The worker eggs are deposited by the queen in worker cells in the comb and are always fertilized eggs. The drone eggs are unfertilized eggs and are usually laid in drone cells, but may be laid in worker cells under certain conditions. Normal queens lay many more worker eggs, than drone eggs and the queen is probably able to control the fertilization of the egg, which determines its sex.

Queens are reared from fertile or worker eggs by a special process, of feeding and changing the shape of the cell. This special feeding, beginning as it does on the fifth day from the laying of the egg, develops fully the female organs of the insect which would otherwise have matured as a worker bee. A worker bee is thus seen to be an undeveloped female. A queen develops from the egg in sixteen days. She emerges from a cell of peculiar form and is considerably larger and longer, nar-


WORKER
QUEEN
DRONE

rower of abdomen, and thicker and smoother of thorax, than the worker. She eats honey as soon as she emerges and remains almost unnoticed by the workers in the hive until twelve to twenty-four hours of age. The fifth or sixth day after emergence, if pleasant, she takes her "wedding flight". When ready to fly, she goes to the entrance of the hive and after several short flights from the hive in order to get her bearings, apparently that she may find her way back, she flies out into the open and returns some fifteen minutes or more later with the reproductive organs of the drone, the male bee, attached to the end of her abdomen. When she enters the hive the workers remove the bulk of the male organs, the portion left dries up in a few hours and is at last discharged by the queen. In two or three days, the new queen begins to lay fertile eggs. Before the queen has met the drones she is called a "Virgin" after she begins to lay, she is called a "fertile" or "laying" queen.

If a virgin fails to mate she will in time begin to lay drone eggs exclusively. She is then called a 'drone layer". Old queens may become "drone layers" sometimes due probably to the exhaustion within the queen of the fertilizing fluid from the drone. An average queen may lay, in the height of the season, more than 3000 eggs in twenty-four hours but this is done only for a short time and with unrestricted cell room for the deposit of eggs. She gradually works up to this capacity and then gradually ceases.

The queen is the mother of all the bees in the colony. When a new queen is introduced into a colony, as the old bees die off and new ones hatch out from the eggs laid by the new queen, she will in time, be the mother of all the bees in her hive. The queen is not in any sense a ruler, as the term would imply, although her presence is essential to the welfare of the colony. The workers as a body determine what will be done in the colony in all cases. A colony of bees is a democracy and not a monarchy as is generally supposed. The queen has a sting which she uses as a rule against rival queens only, and not against anything else. Queens may be handled without any fear of receiving stings, but care should be taken in handling them that they are not injured, by pressure of fingers upon the abdomen. They may be safely grasped by the wings or about the thorax.

The drones are the male bees. They develop from infertile eggs laid either by a fertile queen, a virgin queen, or a "laying worker". Drones from eggs laid by "virgin" queens or laying workers are apparently just as virile as drones from the eggs of a fertile queen. The drone develops from the egg in twenty-four days. Drones normally hatch from drone cells which are slightly larger than worker cells. They are much larger than workers and are shorter than queens with a more rounded, stubby abdomen, and much larger thorax. They have a characteristic hum when flying. The drone is a gentleman of leisure. He eats what he wants from the honey cells and takes from the mouth of nursing workers. On clear warm days he flies out of the hive particularly in the warm part of the day between the hours of eleven and three. It is during this part of the day that virgin queens fly among the drones in the air to mate. The quickest and swiftest drone catches the queen, couples with her in the air and generally high up, both together fall to the ground, and the drone expires. The organs of the drone can be seen if one is picked from in front of the hive just as he is preparing to fly, a gentle pressure upon his abdomen will cause the organs to break out with a slight pop and the drone will die almost immediately. In the later part of the season, when honey becomes scarce in the field and there is no longer need for drones to fertilize queens, the workers force them outside the hive where they soon perish of cold and starvation. The drone has no sting, he can be handled with perfect safety.

The workers compose the great mass of bees in a colony. A colony of bees may contain anywhere from a few hundred upwards to 80,000 workers. The duties are to defend the hive, to clean and ventilate it; to rear the young, gather the food and water from the fields, to gather the bee glue or propolis, secrete wax, build combs and to attend to all the many labors of the hive. It is the workers which really govern the colony although there is no actual government — everything is apparently done by common consent. As has been said, the worker bee is an undeveloped female, that is, her female organs are not fully developed as are those of the queen. Under certain conditions a worker may, however, lay eggs, these eggs produce drones only, never workers. These workers which lay eggs are known as "laying workers". The conditions which causes the appearance of laying workers is that of prolonged queenlessness. When a queenless colony has no means at hand to rear a queen, certain worker bees, usually a good many in the colony, begin to lay eggs. The eggs are laid in irregular patches, scattered about the combs, and not placed in each cell in regular succession as they are with most normal living queens. They often lay several eggs in one cell but this by no means is a sure sign of laying workers, for good queens when first commencing to lay or early in the season, may put several eggs in a cell and even lay them on the side of some cells. A quantity of drone brood, irregularly scattered in worker cell, is a good indication of the presence of laying workers. The drone brood can be easily distinguished by the formation of the cappings. Drone brood cappings stick up above the surface of the comb like little hemispheres. The capping of the worker cells are nearly flat. Cappings of brood can be told from cappings of honey with certainty by breaking them, and learning what is under them. Brood cappings are brown, smooth and fibrous, made of a mixture of wax and pollen. Honey cappings are white when new but darker with age, when left in the hive, and are made entirely of wax. The whole surface of capped honey is rough and irregular and individual cells do not stand out as prominently as with brood cappings. The difference may be confusing at first sight, but when it is once discovered there will be no further trouble in distinguishing brood from honey.

As with all insects, bees have four stages in their lives. The first three are spent in the cells of the comb. Bees in these stages are collectively known as "brood." The three stages of the brood are the egg, larva, and pupa. The eggs are a tiny whitish, oval shaped mass adhering to the bottom of the cell, by its smaller end. The larva is a white worm-like body, first lying curled up in the bottom of the cell but as it grows, it gradually straightens out until it lies on its back with its head toward the mouth of the cell. In this position it spins its cocoon within the cells and is capped over by the workers. When the cocoon is complete it undergoes its pupa transformation, developing legs, wings, etc. When fully grown the bee gnaws away the capping and crawls out upon the comb. It is then an adult insect. Young bees can easily be told by their silvery gray, downy and weak appearance, old bees on the other hand, have lost most of the hair from their bodies and have as a consequence a smooth glossy appearance. Their wings are often ragged from flying. The young bees are the nurse bees. For the first sixteen days of their lives they remain in the hive, only taking occasional flights in front of the entrance during the warm part of the day. They attend to the labors inside the hive, such as feeding the larva, packing and sealing honey, secreting wax, building comb, removing refuse and later guarding and ventilating the hives. As soon as an egg hatches into a larva, it is fed chyle secreted by glands on the mouth and thorax of the nurse bees. The larva are fed this chyle or royal jelly until they are fully grown if they are to be queens. Worker larva are fed chyle for two days, after that a mixture of pollen and honey until they are about to spin their cocoon. When about sixteen days old the young bees become foragers or field bees. They fly to the fields to gather honey, pollen, propolis, and water. They are then field bees for the rest of their lives unless through some accident the colony is deprived of its nurse bees. In this case the younger field bees must again become nurse bees but they are never as good nurse bees as the young bees. During heavy honey flows, the workers die from old age and exhaustian after being in the field about twenty-six days. The average life of a worker bee in the busy season is about 42 days or six weeks. When there is no honey to gather and hence very little field work, bees live much longer. The great bulk of those which enter the winter hive, live until the young bees begin to hatch in the spring, provided the colony as a whole survives the winter.

Those which die in the winter drop to the bottom of the hive, or crawl just outside, but those which die in the warm season fall from exhaustion while at work in the fields. The length of a drone's life is uncertain. It is likely several months unless he is driven out by the workers and starves or he mates with a queen.

Queens have been known to live five years, being at their best during the first and second and often doing well the third season. In her fourth or fifth year, or before she fails from any cause, a queen is superseded. Bees prepare to supersede a queen by building queen cell cups on each of which the queen lays an egg. The queen resulting from one of the queen cells hatches, mates, and begins to lay soon after the death of the old queen. In a few instances the old queen and the young may be both found laying in the hive at the same time. This condition when it does occur lasts only a short time, for the old queen soon passes away. The presence of two queens in the hive often accounts for failures in introducing another queen. Superseding usually occurs after the main honey flow, in midsummer or early fall.

The time required in each of the brood stages by the three kinds of bees in a colony is given approximately in the following table taken from "The Honey Bee.": Bulletin No. 1, Bureau of Entomology, United States Department of Agriculture.

	Egg	Larva	Pupa	Egg to Adult
Queen	3 days	5½ days	7 days	15½ days
Worker	3 days	5 days	13 days	21 days
Drone	3 days	6 days	15 days	24 days

COMB BUILDING

Bees build comb for the double purpose of cradling their young and storing their food. This comb is made of wax. The wax is secreted by the workers from glands situated under the scale-like rings on the ventral side of the abdomen. Little scales of wax form on the under side of the abdomen and are removed by the bee with its legs and fashioned into comb by the jaws, or mandibles. When secreting wax, the bees hang in sheets clinging foot to foot, and leg to leg in a most marvelous fashion oftentimes forming very pretty designs.

The comb is built perpendicularly with a middle septum from which extends on each side the walls of the cell. The cells are six-sided with a three-sided base. A six-sided figure or hexicon allows the cells to be built side by side without waste room. The three-sided base is so built that each of the three sections form a third of the base of each of the three separate cells on the opposite side of the comb. The worker cells usually form most of the comb. There are about five of these cells to the linear inch and thirty to the square inch on each side of the comb making sixty worker-cells per square inch of comb. A normal colony will require for breeding purposes or for brood nest upwards of twelve hundred square inches of comb. This is about the amount allowed by eight Hoffman or similar frames, 17 x 9 inches.

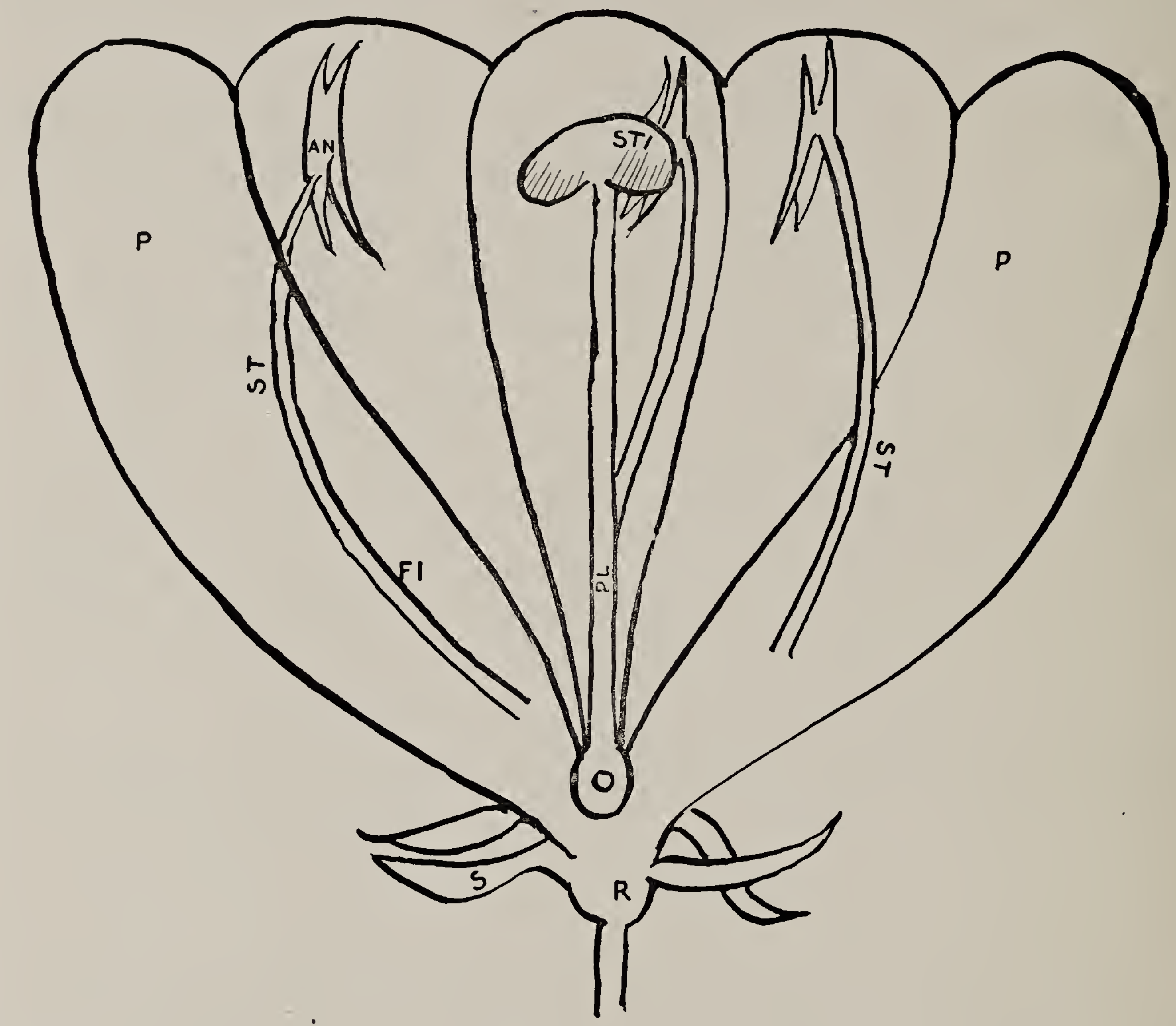
Drone cells are about four to the linear inch, sixteen to the square inch of surface or thirty-two to the square inch of comb. The cells between worker and drone comb are of necessity irregular because of the change from one size cell to the other. The fewer drone cells a colony has the less drone brood will be reared and as drones are but useless consumers the fewer there are in the colony the better. There is very little danger of having not enough drones reared to fertilize queens, but often there are too many drones consuming the surplus honey. The way to suppress drone-rearing is to prevent the building of drone comb by the use of comb foundation, by cutting out all that is built, and patching up the comb thus out with worker comb, or foundation.

Queen cells are not a part of the regular comb but one built along the edges or in any irregularity of the comb. They are thimble shaped with the small end hanging downward. This small end of the queen cell is the mouth and from which the queen emerges. It is thus seen that the queen develops with her head lower than her body. Although the cells are from one to one and one-half inches in length, it is difficult or impossible for a blind man to recognize them by touch alone. The larger and thicker a cell is the stronger and more vigorous a queen hatching is likely to be. Queen cells are not present in the hive at all times but are built only when required. When queens are reared by the bees to supersede an old queen or in preparation for swarming queen-cells are constructed and eggs are placed in them by the queen. When a queen is killed or removed leaving a colony queenless, queen cells are built about worker larvae under three days of age or six days from the laying of the egg. Queen cells are heavily and irregularly coated with wax. When the cell is nearly "ripe" or ready to hatch the bees remove most of the wax from the tip of the cell leaving a thin brown shell for the queen to cut through when the queen has hatched the bees destroy her cell; they gnaw it down until only a small cup remains and often not so much as that.

BEE PRODUCTS

Honey is the primary product of the honey-bee. It is the nectar of flowers gathered, prepared and stored by bees. Sugar, any material fed to bees can never be converted into honey. It may serve the same purpose so far as feeding the bees is concerned but will never have the flavor nor the aroma of real honey. It does not pay in dollars and cents to feed anything for the purpose of producing marketable honey. Real honey cannot be thus produced unless real honey is fed, hence the sale of such a product is dishonest and contrary to the pure food laws. Bees use honey for their food. In winter it is the only food consumed. It corresponds to the starch and sugary matter of a person's food: it furnishes heat and energy and contains enough pollen to furnish the nitrogenous food needed in winter.

Pollen is gathered from flowers and is carried to the hive for food. Bees cannot rear brood without plenty of pollen. The nurses must eat pollen in order to secrete the chyle to feed the larvae. It is the meat-like or nitrogenous portion of the bees food. Inability to secure pollen in the spring causes delayed or diminished brood rearing. Bees gathering pollen ordinarily visit but one species of flower on any one trip. It is by distributing pollen that the bee performs its great services to the



TYPICAL FLOWER
P. PETAL S. SEPAL ST.
STAMEN - THE MALE PART
AN. ANTHER FI. FILAMENT
PL. PISTIL - FEMALE PART
STI. STIGMA O. OVARY R.
RECEPTACLE

farmer and horticulturist. When gathering either pollen or honey the bee becomes covered with pollen and in passing from flower to flower leaves some pollen on the stigma of each flower it visits thus effecting cross fertilization. The bees scrape the pollen from the hairs of the body and pack it in a cavity, called pollen-basket, on each hind leg whence it can be seen as a yellow colored pellet. In this manner it is carried to the hive. It is stored in the comb of the hive and used as needed. Bees prefer fresh pollen when it is to be had. They will use stored pollen only when the fresh pollen cannot be secured. Beeswax is the only material manufactured by the honey bee. Honey is nectar gathered from flowers changed in some way by the bees, but wax is an entirely different product from what the bees gather as nectar. Wax in a freshly made comb is pure white but the combs darken with age if left in the hive where the bees are constantly crawling over them. Comb will darken from the accumulation of cocoons left by each hatching brood. Wax, as found in the markets, if of any color from dark brown to white, depending upon the amount of dirt incorporated with it, and the amount of bleaching to which it has been subjected. It requires the consumption of considerable honey (estimated at from seven to twenty pounds) to produce one pound of wax. Beeswax is the only material which can be used in many plastic arts.

Propolis, or bee glue is a resinous substance with which the bees seal all cracks and crevices of the hive and fill up all spaces through which they cannot pass. It is gathered from three buds, and sometimes from paint cans, and from any sticky substance to which the bees have access. The amount gathered and used varies greatly with the locality. In some places hardly any is used and in others it is so plentiful as to seriously interfere with the manipulation of the hive. Some races of bees will gather much more propolis than others. The blacks for instance coat the entire inside of the hive with a heavy coating of this sticky substance, while the Carniolans will use wax very largely for their sealing proposes. Salt is also gathered and used by the bees as it is used by practically all animals having a vegetable diet. A supply of salt should be made available. Place a small tub of water in a protected location on the surface of which is left floating a few sticks to prevent the drowning of the bees, add about a tablespoon of salt for each gallon of water.

The above gives a good description of bees and is taken from the course of the Penn State College. It seems surprising that little is known about the honey-bee among the average American, the knowledge seems to be limited to the two facts, namely, bees sting, and make honey. But with a better understanding and appreciation of bees they will have little fear of the sting and a higher esteem for the honey.

CHAPTER IV

Swarming. Swarm Control. Supersedure. Queen Rearing. To Requeen a Colony. Two Queen Hives. When to Requeen. Clipping Queen's Wings. What to do When a Hive Swarms. Handling Swarms. Introducing Swarms to Build up a Colony. Hive Odor. Introducing Queens.

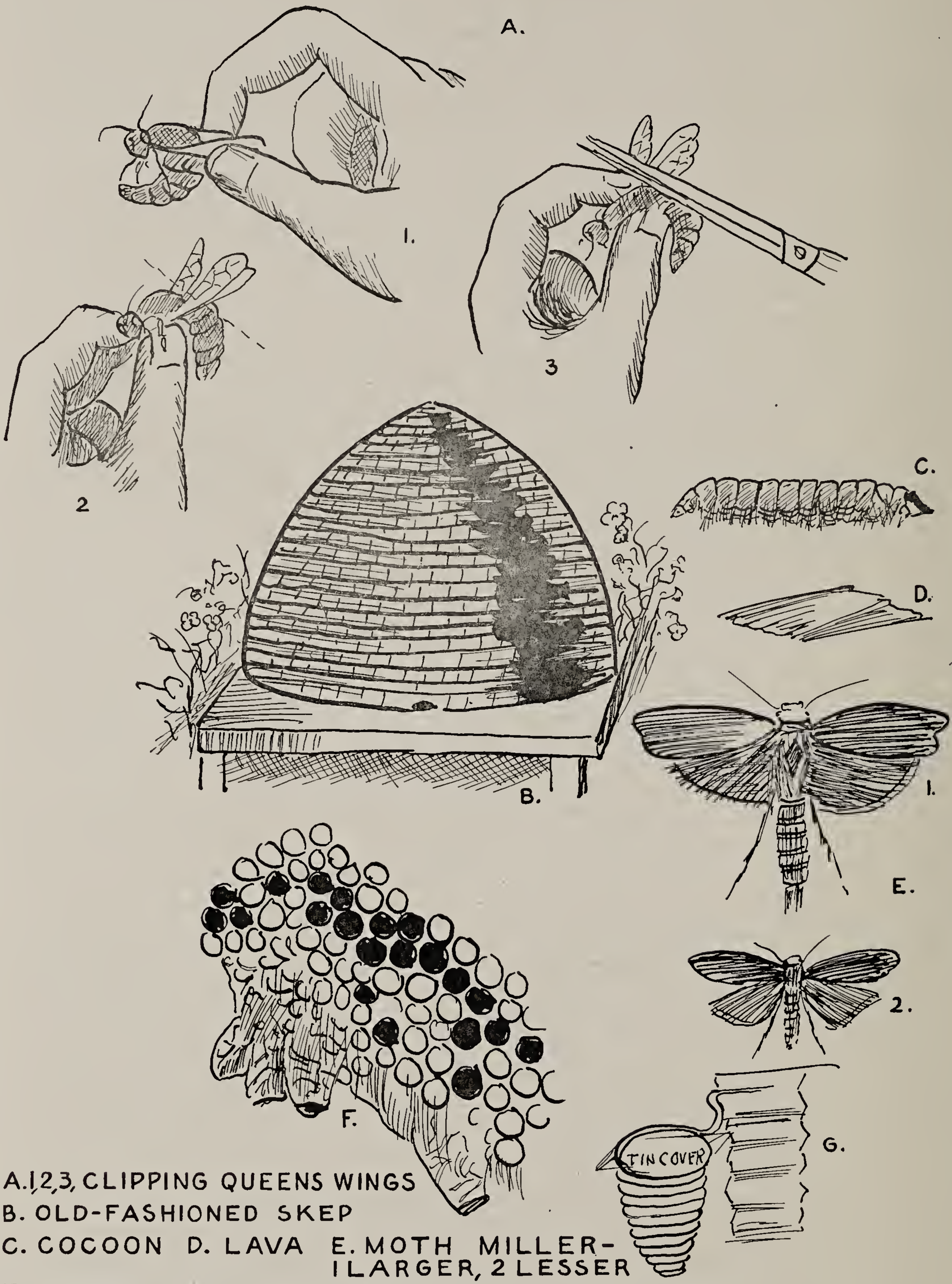
Many people have observed swarms of bees either in the air or when attached in a cluster to a tree, or any other convenient place selected by the bees. Sometimes these swarms may consist of a small number of bees a few thousand strong, or a large swarm of 50 thousand or more. The bees leave the old hive for many reasons, such as lack of stores, disease, etc. But the general and most natural reason is lack of room. This happens most often in the spring when the queen having filled all the cells with eggs and the remaining combs filled with brood, honey and pollen, the hive becomes strong with bees, and lacking sufficient space becomes congested so that it is necessary for the bees to look for a new home. When this time arrives the bees will build queen cells and when these are capped the swarm will emerge, generally in the warm part of the day, to go directly to a place already selected by the scout bees, or to wait nearby on a tree, bush or shrub until hived by the beekeeper. Unless the swarm is captured the loss to the hive is great, for only the baby bees, or nurse bees are left in the hive and it will take some time before the virgin is mated and starts laying. Then the hive will begin to build up again. This swarming sometimes occurs when the honey flow is on. The old queen is the one to leave with the swarm, though sometimes a swarm will emerge with a virgin queen. Generally, these after swarms are not very large. When this occurs the parent hive is left very weak and if the honey flow should cease, it dwindles to almost nothing and becomes victim of robber bees from the stronger colonies.

If the beekeeper wishes to hive the swarm into another hive, to increase the number of hives in his apiary, the manner of doing so is very simple. If the swarm is attached to the limb of a tree or shrub, take a pair of clippers and cut away the outside twigs surrounding the swarm. Then holding the branch with the swarm firmly with the left hand, carefully cut the branch with swarm free, with a sharp saw. Carry the swarm and place it in front of the entrance or lay them on top of the frames where they will quickly enter the hive. One can soon learn to tell when the queen has entered by the conduct of the bees; they are quiet and contented, keeping their heads low and their ends elevated and wings fanning When they remain, place the cover gently on the hive and do not disturb further. I think it is wise to feed the new swarm for a short time until sufficient nectar and pollen is coming in to supply their needs. It is understood that when a swarm emerges from a hive they are pretty well filled with honey and in that condition are easy to handle. They are not liable to sting if they are handled deliberately and slowly. On the other hand, if the apiarist does not wish to increase the swarm, then the following method is recommended for returning the swarm back to the hive from which they absconded. First, carefully examine the hive from which they emerged for queen cells which should be destroyed. This procedure cannot be performed without the use of sight. Then place another hive body in a place of the lower one of the parent hive, with either drawn comb or foundation. Place the swarm at the front entrance using a little smoke and there will be little trouble in getting them to enter. Now with plenty of added room it will not take them long to draw out the foundation, or fill the cells with pollen in preparation for the queen to start laying. Remember the bees of the swarm are the worker field bees, and the main factor insofar as surplus honey is concerned.

There are many ways to prevent swarming, but let me state right here that there are certain strains of bees that will swarm in spite of anything one can do. These are a nuisance and the remedy I suggest is to requeen with another strain. Now that we have explained that overcrowding was generally the reason for swarming, we will see that our bees have plenty of room, both for the storage of pollen and honey and the space for the queen to lay. Ordinarily it is a bad thing to disturb the brood nest, but in the spring when the honey flow is heavy and the queen cramped for space to lay, remove four or five of the frames from the sides of the center and replace with either foundation or drawn comb frames, placing the frames taken from the lower hive in a hive body above. This will give the needed space and will encourage the bees to work in both hive bodies and store surplus honey in the supers above.

Supersedure is a condition brought about when for some reason the bees wish to replace the queen. Perhaps she is too old, or cannot keep up with the strength of the colony. The workers seem to sense this and will make preparation for the rearing of another queen by making queen-cells, called supersedure cells. These cells are generally built on the sides or the crevice of the combs. When the cells are ripe, the first young queen to emerge commits the crime of matricide by killing the mother and throwing the body outside. This takes place without swarming. A good reason for clipping the queen's wings, apart from its many other advantages, is that when we find a queen with complete wings, we are able to tell that there has been a supersedure by the new queen.

Queen-rearing — In 1942, there were over 400 tons of package bees shipped from the south to the northern beekeeper. These two and three pound packages usually contain a queen, thus giving some idea of the number of queens raised by the queen breeders of the south. One can understand, however, that queens transported with package bees or in cages through the mail, are not likely to be as good as those raised by the beekeeper from selected stock in his own apiary. Also,

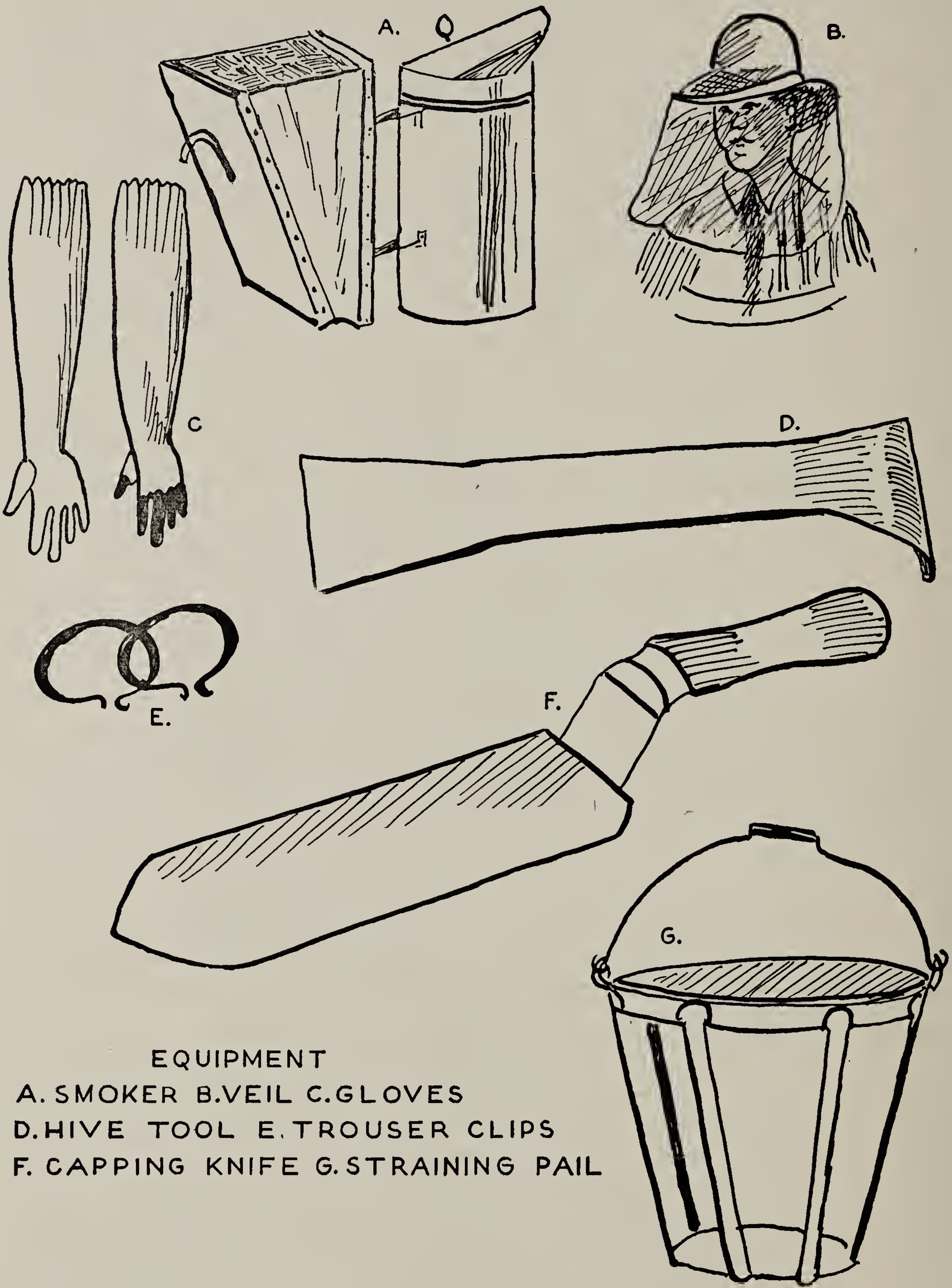


A.1,2,3, CLIPPING QUEENS WINGS
B. OLD-FASHIONED SKEP
C. COCOON D. LAVA E. MOTH MILLER—
1 LARGER, 2 LESSER
F. QUEEN CELLS G. QUEEN CELL PROTECTOR

my experience with other beekeepers has been that the bees seem to get alon gall right for a time; then when everything appears to be satisfactory, for no apparent reason the queen dies, or they swarm or supersede. This, of course, delays the building up of the colony to a large extent. Therefore, I think the beekeeper should know enough so as to be able to rear his own queens. In this way he will be able to select the queens from his best strains. The blind beekeeper will have to be assisted by a sighted member of his family or by a sighted friend in making this selection.

Perhaps the simplest way to rear queens is to take the inner cover and cover the small opening in the center with a small piece of excluder screen and place this above the lower hive body, first being very careful that the queen is in the lower hive. Then place some frames containing brood and eggs above the inner cover so that the only passage for the bees is through the small inner cover opening. The bees above, assuming you have plenty of bees in the hive, will start to draw queen cells in about twelve to twenty-four hours. Then you can remove the inner cover and place a regular excluder in its place. Do not permit the queen to get into the top hive body. When these queen cells are ripe, the frames can be placed in a nucleus hive, or a small opening can be cut in the rear end of the excluder and the virgin queen can be allowed to leave for her mating flight. When she is found to be laying, she can be introduced to replace an unwanted or old queen. If you just want to replace the old queen on the hive upon which you have reared the young queen, kill the old one, leave the excluder on for twenty-four hours, and then when the young queen is laying she will be readily accepted. This is a practical and simple way to requeen and has the advantages of being a good way to determine the strain of bees, as the queens can be selected from the best producers and gentle stock. Another plan often adopted by beekeepers when a hive is found to be queenless, is to take a frame of brood and eggs from another colony and place it in the center of a queenless colony, remembering that the frame must contain either unhatched eggs or larvae not only two days old. The bees will soon start to draw queen-cells around the eggs, and in eleven to thirteen days the young queens should be ready to emerge, and in about six or seven days will take their mating flight.

It is understood that each hive has its peculiar odor, thus the bees of a strange hive are not accepted except when they are loaded with nectar or when the hive is very weak, and no guards are present. Drones are an exception as they seem to be privileged characters and can go into any hive. The question of two queen hives is sometimes tried. With some it may be successful, but with others my experience has been that it does not pay. The idea, of course, is to have a queen in each hive separated by an excluder, the thought being that the progeny of the two queens will produce more honey. But from my experiments the hives separated in the usual way is more successful in every respect, being much easier to handle and examine.



EQUIPMENT
A. SMOKER B. VEIL C. GLOVES
D. HIVE TOOL E. TROUSER CLIPS
F. CAPPING KNIFE G. STRAINING PAIL

The best time to requeen is either in the spring or fall when the honey flow is strong. Of course, if you find a colony queenless it is better not to wait in giving them a queen or ripe queen-cell. The queens can be introduced in the usual way, by the mailing cage method, being sure that the colony has been queenless for at least twelve hours. If you have a nice young laying queen, put her in the cage with half a dozen attendants and put a piece of wood in the hole of cage. After the cage has been on top of the frames of the queenless colony for twenty-four hours, pull the stick out and she will be readily accepted. It is a good plan to clip the wings of the queens when they are laying, thus preventing the loss of the swarm when the bees leave the hive. The bees may collect and cluster on tree or shrub for a while, but realizing the queen is not with them, they will return to the hive, thus the swarm is not lost.

Clipping the queen's wings is a simple though delicate operation which requires sight to be successfully performed. Take the queen from the comb by her wings with the right hand, laying the frame back in the hive. Hold the first and second finger and thumb of the left hand over the head and thorax, holding her firmly but gently. With a small scissors clip off two thirds of both wings, and taking her by the right hand again release her on the frames. Be careful not to cut a leg. Practice on a few drones before trying the experiment with a queen.

In rearing queens, the best time will be in the spring or August when the spring or early fall honey flow is on, and not too late in the fall when there are no drones for the purpose of mating. When these late queens start laying, the chances of having a nice lot of young strong bees to go through the winter is much better and the prospects of a good start in the spring is more hopeful.

CHAPTER V

Examining Hives. The Use of the Smoker. Handling the Frames. The Brood Nest. Supers For Surplus Honey. When Colony is Ready For Supers. How to Arrange. Extracted and Comb Honey Production. How to Use the Honey Knife When Honey is Ready and Ripe For Extraction. The Extractor. Straining, Bottling, Heating, Etc.

Reading books and learning the theory of beekeeping is good, but the real practical handling of bees, the opening of a hive and the many and varied operations in connection with beekeeping is another matter. This is what we are interested in. There is certain equipment one must have, such as the smoker, bee-veil, hive tool and perhaps at the start, bee-gloves. (These latter you will discard or very seldom use as time goes by and you gain experience.) It is understood that fear causes certain glands to exude an odor which bees, as well as animals can detect, therefore, try to control your feelings and be well provided with veil and gloves. As stings on the legs are very painful, the use of a pair of bicycle clips around the pants will prevent bees from climbing up inside them. Light the smoker, using cotton rags or sumac burrs as fuel. One of the best things is dead dried out rotten apple wood. This lasts long and the smoke of which does not seem to irritate the bees. As you lift the inner cover put a few puffs of smoke at the entrance. Never handle bees with quick, jerking or jarring motions. Slow and deliberate action will be found to be the best. With the hive tool, loosen the frames first on one side, then on the other. Remove one of the frames near the outside so as to give more room to the examination and removing of the frames. Lift the frame by the end of the top bar and hold up to the light, then reverse by swinging upside down slowly. Be careful not to pinch a bee in picking up the frames, for then naturally, you will be stung and the venom odor will arouse the other bees. Take your time, and if you should be stung, use the smoker on the place where the sting entered and this will destroy the venom odor. Never pull the stinger out with the finger and thumb for this is liable to squeeze the venom in. Take the sharp edge of the hive tool or the finger nail and lift the stinger out. When using the smoker, blow the smoke along the top of the frames and not down into the hive. The purpose of the smoke is to make the bees fill up on honey, which will generally keep them quiet.

The brood nest are the frames generally located in the center of the hive, the outside frames being filled with pollen and honey. It is a good plan not to disturb the brood nest as this may disrupt the heat of the hatching brood. When the brood hive is well filled with brood and pollen it may be time to add either a full depth or shallow super on top as a food chamber, always bearing in mind that the queen must be provided with plenty of space for laying. This is especially true when the honey flow is strong (May and June), and it is at this time that the bees are generally ready for supers for surplus honey. If you are using full depth supers it may be a good plan to remove some of the outside frames from the lower hive and replace with either drawn frames or foundation. Place these frames above an excluder, as this will encourage the bees to work through the excluder. If there should be any unhatched cells when these emerge, they will find their way below in the regular way. I find this a good way to educate the bees to travel through the excluder; it seems that some bees would rather swarm than pass through the excluder, but where there are any baby bees or a brood they will overcome this reluctance. When the honey flow is strong the supers can be added as needed, but it must not be overdone: When a super is two-thirds full and the tops of the frames are coated with a little burr comb, they are ready for another super. It is a good plan to place the empty super under the partly filled one, as the bees generally work from the top down, and as near as possible over the brood chamber. It is well to remember at all times that too many supers means more added space for cold air, and it will generally be found that bees work much better when congested than when given too much room: this is something that must be learned by experience. Especially is this so when producing comb honey. The bees are apt to start queen cells and swarm if they are compressed too much, and unless examined every eight or ten days are liable to give trouble adn often just when the honey flow is good. Therefore, it is essential that a sighted friend keep the blind beekeeper informed of these conditions. Comb honey production involves more work in assembling the section boxes, etc.

When honey is ripe it is ready for extraction. Honey capped is always ripe, but uncapped honey may not be ripe, or cured. This can be tested by shaking the frame and if the honey can be shaken from the frame it is unripe and must not be put in the extractor for it will ferment and it will cause the other honey to ferment also. It is better to set any supers containing frames of unripe honey back on the hives for the bees to clean out, and if near the end of the season on top of the inner cover so the bees can pass through the hole and rob the honey for storage below.

The honey knife is necessary for uncapping the combs. These knives are of different kinds, some being used by tubes connected with a kettle — a steam knife. Others are heated by electricity, having a resisting unit inserted along the blade and insulated. These knives are very efficient and when kept sharp do the work quickly. If using the ordinary knife, it is best to keep it in a pan of boiling water when not in use, for the hotter the knife, the easier it is to uncap.

The extractors are also of different sizes and makes. The two frame extractor is probably large enough to meet the small beekeeper's needs, while the large commercial beekeeper will want an extractor that will take 50 or more frames. These larger ones, of course, are driven by power, but even the smaller ones can be used by ¼ h. p. motor and the necessary adjustments made. I converted my own simply by attaching a table and friction wheel. I believe an arrangement can be purchased from the equipment houses for the same purpose. When the frames are all extracted, it is a good plan to set the supers over the inner cover, as mentioned before regarding unripe honey, and leave them for the bees to rob the residue left by the extractor. If left on the ground the bees will commence robbing them from all the hives and this may prove to be a mistake, for once the bees get a taste of ripe honey they will stop at nothing to get it. If you should have a weak colony or nuclei in the apiary it will simply be a push-over for these demons. Moreover, anyone going near the hives are liable to get stung. But if you place the empty supers over the strong hives quietly, no harm will be done.

When the honey is extracted it should be properly strained either through fine cheese-cloth or a fine mesh wire strainer, and after settling should be put in cans or bottled. I do not like to heat honey for the sound reason that heating honey destroys the best medicinal value of nature's own sweet. But if heated to prevent crystalization, never go beyond about 130 to 150 F.

Now comes the questions as to the storage of the supers for the next season. Understand that the moth miller is the culprit to be treated. The simple plan is to set the supers tiered up about six full depths high, make them air tight, then pour about two ounces of carbon bisulphide over the top of each stack of six. Put the cover on and leave for a few hours, or until the following day. This gas, being heavier than air, works from the top down. When treated with the gas, store the supers in a cold place like the garage, or outside where it is bound to be cold. Pile the supers on top of each other, placing a newspaper under each and shaking some moth flakes on each paper, then tie them securely covering the top so that all will be completely moth-proof. If this is done properly they will be ready for next season, but if stored in a warm place such as a cellar or basement, the eggs may still hatch and cause trouble. There is a chemical known as Methyl Bromide that can be purchased from the Dow Chemical Co., Midland, Mich., which is quite effective, but if the supers are treated as I have suggested, the latter will not be necessary. Always clean up and examine everything carefully before putting it away for the following season, especially the extractor, knife, etc.

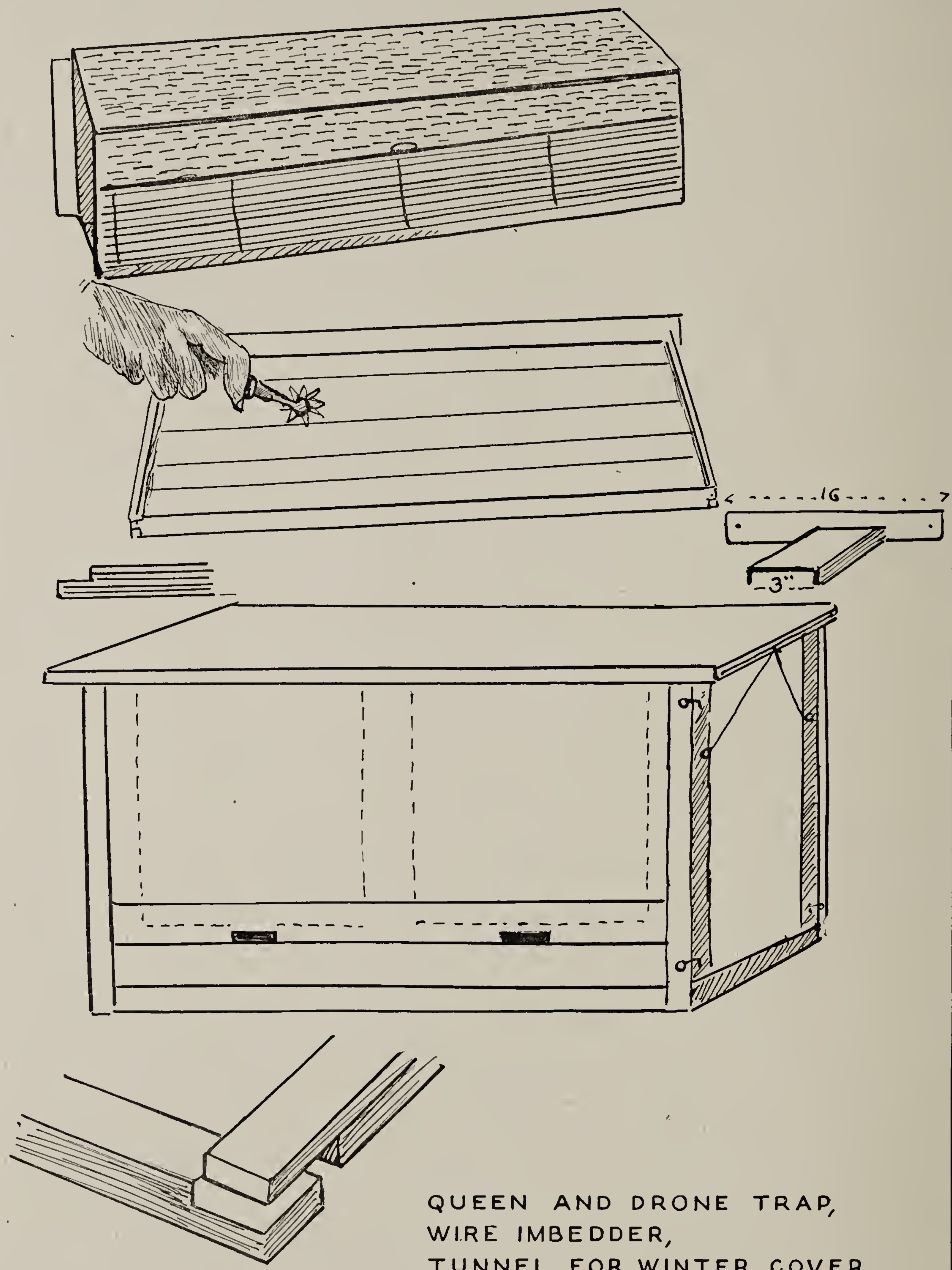
CHAPTER VI

The Wintering of Hives. Amount of Stores Per Colony. Covering the Hives. Top Entrance For Winter. Insulation of Hives. Size of Entrance. Protection From Mice, Skunks, Etc. Feeding Bees For Winter and Spring. Wax and How to Render For Sale.

Much depends upon the locality as to how much will be necessary for the safe wintering of the colonies. Where the winter climate is very severe, the hives will naturally need more consideration than where the temperature does not drop so low. You will be guided by the average temperature of your own locality. For New York State, where the temperature in the northern section drops much below zero, and in the lower parts of the state much milder weather is experienced, a difference in the protection is, of course, to be observed. My friend, Professor George Rea of Cornell University, did a lot in educating the beekeepers of New York State in teaching them a simple and inexpensive way of wintering hives. This was done by using some lathes and roofing paper and filling paper wrapped around the hive or hives with dry leaves three or four inches thick. This should be well pressed all around, the hives also standing on a foundation of leaves. Then the whole should be firmly fastened by strong cord. When properly done, this was a splendid method as the results proved, but unless the covering, when taken off in the spring was carefully done, it would hardly be serviceable for use the following fall.

The method I have used for a great number of years with good success has been along the same principle, but has a few advantages. First, the covering can be used year after year. Second, if you should wish to examine the condition of the colony from the top on a mild day to see how the stores are, you can do so much more easily. When the roofing paper has been in the cold all winter, it becomes very brittle and hard to unwrap without breaking. So I make a number of frames, one for each side and one for the roof. These frames are made from furring strips, half lapped at the end joints and covered with rubberoid, which is somewhat stronger than roofing paper. The frames are made to extend about four inches beyond the hive or hives, to allow the space to be thoroughly packed with leaves. When the frames are made, the front frame must have an extra large strip to be notched out to cover snugly the tunnel which is made as follows and attached to the front entrance of the hive: Take ½ inch wood and make a tunnel 4 inches wide and ⅝ inches high and equal to the distance of the space, as suggested, about four inches. This tunnel is fastened to a piece of furring strip, the width of the hive, and notched in the center for the tunnel and attached to the hive by a nail at each end. This is the first step in the covering of the hive. When the strip containing the tunnel is in place, notch out the place on the front wide strip to fit the tunnel, then place the other three remaining frames around the two ends and back. These can be fastened together by screw-eyes on the inside, or nailed by brads. The screw-eyes are much better as they will help to assemble in the future and make the work much easier. When the frames are securely fastened, pack the leaves tight all around. *Now please observe the following, carefully*: on the inner cover hole in the center of the cover, place a piece of wire-cloth. The purpose of this is to permit the excess moisture from condensation to escape and be absorbed by the dry leaves above. When the wire-cloth is over the hole of inner cover, pack three or four inches of leaves on top, press down, and place the top of hive in place loosely. Now make a frame for the roof which should be made to overlap a few inches all around. I might mention that the rubberoid is placed on the inside to withstand the packing of leaves. When the top, or the roof, is made, place a screw-eye in the center of both ends for the purpose of securing the same to the ends of the frames, using a strong piece of cord, or better still would be some binding wire. This will hold the top against the winter storms and winds. If your hives have top entrances, the front strip and tunnel are made to comply with this style.

Top entrances for hives have many advantages, in that the space at the entrance permits the moisture from condensation to escape. Under-



QUEEN AND DRONE TRAP,
WIRE IMBEDDER,
TUNNEL FOR WINTER COVER,
TWO HIVE WINTER COVER,
HALF LAP JOINT

stand that it is not the cold that kills the bees, but the dampness. My friend, Dr. Phillips, told me that experimenting to find out how much cold a bee could stand, he froze a bee in a cake of ice for twenty-four hours and then released it and placed it back in heat and it soon revived.

The main thing, and something which generally does not receive the care and attention it should, is the proper amount of food left in the hive to feed the colony all through the long winter until the first bloom of spring. Fifty or sixty pounds of honey is none too much to leave in the hive, if the colony is strong. This can be estimated simply by remembering that the standard Hoffman frame, completely filled and capped, will contain about six pounds of honey. Therefore, the hive together with food chamber should contain at least this much. It is very poor economy to rob the bees too much in the fall for, I assure you, the honey will not be wasted if left in the hive. Your bees will come through the winter better and stronger for the spring. There will be no need to bother with feeding. Robbing the bees too much is generally the cause of so much loss of colonies in the spring, especially if the spring is late.

The size of the entrance is a vital matter, and unless properly arranged, mice, skunks, etc., will rob the honey. Mice will enter and do plenty of damage. Skunks will lay outside of the entrance, put their paws inside and help themselves to the sweets. The bees seem to be helpless against these pests. That is the reason I make the entrance of the tunnel in winter covering about 5/8 of an inch. If you have not taken the precaution to provide the bees with sufficient supplies for wintering, it will be necessary to feed them, for without food they soon dwindle and die. If, upon examining them on a warm day, you find the bees in need of food, make a syrup of sugar and hot water, about half and half. Feed it over the bees where they can reach it readily and give them as much as they will take down. The use of a feeder made with a Mason quart jar, or large can placed over the hole of the inner cover is generally satisfactory. A feeder is made by simply driving a number of holes through the cover with a 4 penny nail, or drilling with a drill of the same size. If you have not left sufficient stores in the fall, the same thing must be done. Remember, you cannot give them too much.

If the surplus honey is taken off prior to the fall flow of golden rod, etc., the proper time would be about the 10th of August for this section of New York State and within a radius of 50 miles of the city. The golden rod flow will generally supply enough for the winter supply. Other sections, of course, are different and one must learn the time of the honey flows for their own locality and be guided accordingly.

The rendering of wax from extracting frames and old or broken combs is a simple matter. Of course, you can make a solar melter which works very satisfactorily and with little trouble, but if you have none, the wax can be put into a pail with a small amount of water, placed on the stove. The wax can then be strained off into another receptacle covered with cheese-cloth as a strainer. The wax will rise to the surface, the water drained off, leaving the wax. The residue remaining can be thrown away. The wax can be sold or exchanged for foundation. There are several houses who make a specialty of this. A. I. Root has done some for me. Frames that have been discarded from the surplus supers containing old or broken combs, can be rendered.

CHAPTER VII

Pollenation. Increase in Fruit Yield. Spraying of Fruit Bloom. Seasonal Flowers and Various Blends of Honey. The Use of Honey in the Home. Medicinal Value of Honey.

I think it is well acknowledged that the primary value of the honey-bee in nature is the cross pollenation of fruit and flowers, and the production of honey secondary. The florist and orchardist are among the first to recognize the value of the honey-bee. All botanists know that the propagation of fruits and flowers is by the introductions of pollen from one sex of the flower to the other. For instance, the pollen adhering to the stamens, the male part of the flower, must be carried to the pistil, the female part of the flower. This must be done either by an insect, or by artificial means. Some flowers are self-pollenating, that is by the wind, such as corn, etc. Knowing then that there are male and female plants, we learn when the two sexes are borne on separate plants, the plants are called dioecious. Unless both sorts of plants (staminate and pistilate) are in close proximity, no seeds nor fruits are produced. Incidentally, most animals are dioecious whereas most plants are hermaphroditic, that is, each flower possesses both sexes. However, in the case of such plants as corn, Willows, Hickories and some others, the male and female flowers are borne on different parts of the same plant and are called monoecious plants.

From this we see the necessity for pollenation and the essential part played by the insects in this great scheme of nature. In fact, there are some very beautiful flowers which would cease to exist were it not for certain insects. To mention one, the lovely night blooming cereus is pollenated by the spotted hawk moth. The flower opening at night, the moth flying at night — how wonderfully nature is adjusted to make this world a place of beauty.

As stated, pollenation is primary, the production of honey being secondary. The apiarist and orchardist working in harmony meet on common ground, the bees of the one working to the interest of the other.

This is the reason for such a demand by the fruit grower for the bees of the beekeeper. It means added profits in the crops harvested. Take the supply of apples for example: with an orchard well supplied with bees during the spring fruit bloom, the yield will be as high as% greater than without bees. Among many other crops it would be 15 to 20% greater. This is one of the reasons many farmers keep bees. Though they also will appreciate the honey for the pancakes, etc., in the home.

The farmer, orchardist, etc., knowing the importance of the bees for pollenation will be careful to spray the trees, shrubs, etc., at the proper time. Before the blossoms open and again when the petals dry up and fall. When the blossoms are fertilized they quickly dry and fall, but if sprayed while fully open, the bees in reaching the nectaries of the flowers will also absorb the poison, the result being that the bees are quickly killed. Of course, the law is against spraying fruit trees while in bloom but many amateur gardeners are not aware of this and their ignorance means the loss of bees.

There are certain periods when the honey flow is governed by the time the flowers are in bloom, and also in the different states temperature and other factors play quite a part in the honey flow. One must learn the periods of the honey flow in his own particular locality.

Roughly, the time the flora yield honey and pollen is as follows:

March—Skunk Cabbage, Crocus, Pussy Willows, Alders.

April—Apricot Trees, Shad Bush, Sweet Cherries, Pears, Sour Cherries, Goose Cherries, Apples, Dogwood.

May—Sassafrass, Dandelions, Horse Chestnuts, Wild Cherries, Wild Honey Suckles, Blackberries, Clover, Tulip Trees.

June—Raspberries, Grapes, Elderberries, Basswood, Privet, Dentzia.

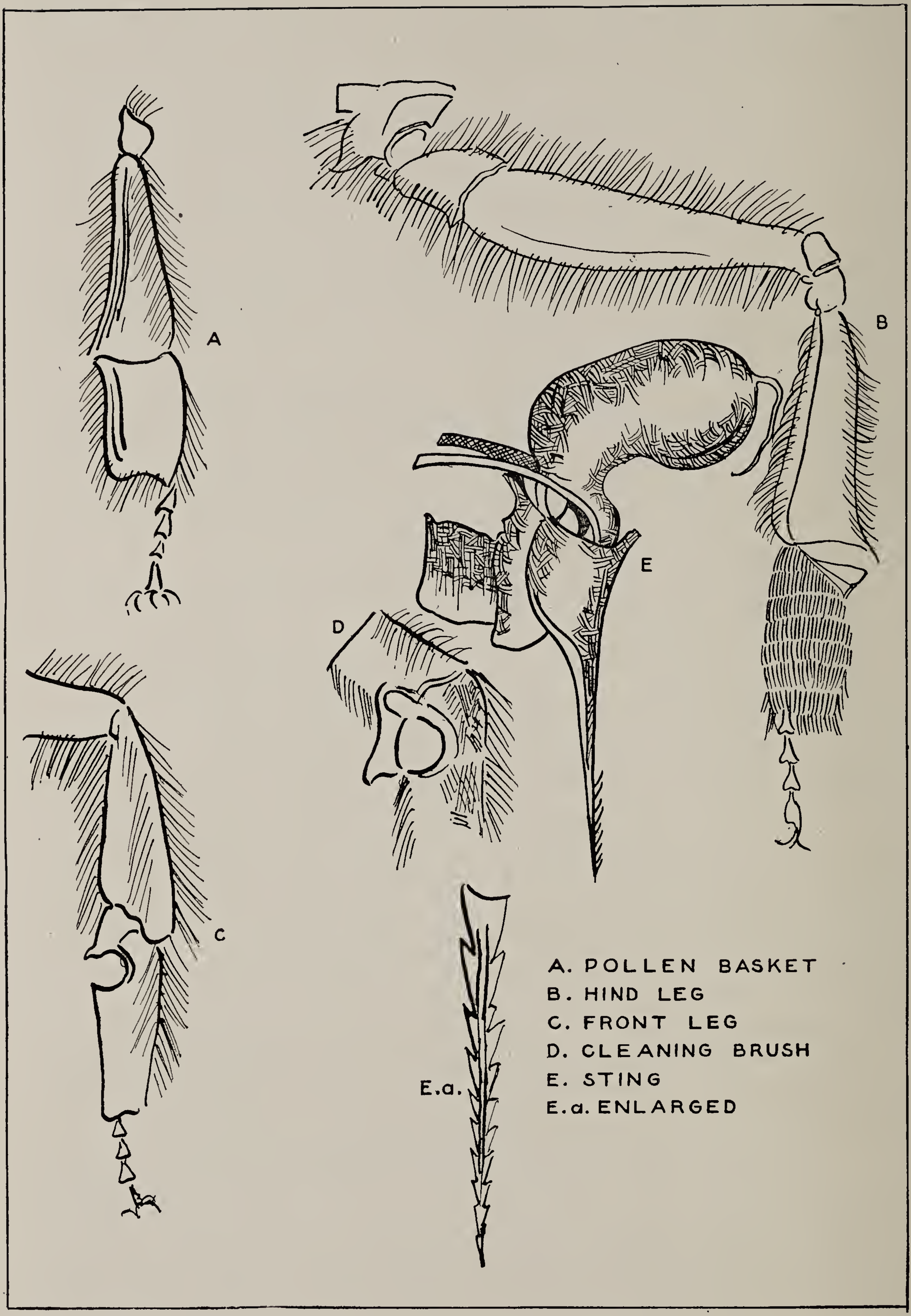
July—Sumac, Purple Loosestrife, Jewel Weed, Peppermint.

August - September—Goldenrod and Purple Aster.

The latter are about the last flowers to yield nectar and pollen before the frost kills the flowers, and in the New York City area, many bee-keepers remove the surplus honey about the 10th of August, for about that time there is a tapering down of the honey flow until the goldenrod is in bloom and ripe for the bees. Many people do not care for goldenrod honey and if it is allowed to mix, will greatly effect the blend of honey when extracting.

Personally, I permit the bees to fill up the hives after the 10th of August with this honey, as this insures the bees against lack of stores over the winter. When the queen ceases to lay sometime in September, then the cells are filled with honey and pollen for the winter feed.

The use of honey in the home is something people should know much more about. As a sweetener it is much to be preferred and also as a substitute in cooking. Generally, it seems hard to educate people to make them honey conscious, but the war has made many turn to honey on account of the sugar shortage. This is good as far as it goes, but more of nature's sweet should be understood and its greater advantage



A. POLLEN BASKET
B. HIND LEG
C. FRONT LEG
D. CLEANING BRUSH
E. STING
E.a. ENLARGED

and superiority over sugar. It is well know that honey is predigested by the bee on its way from the flower to the hive where it is then curred and capped. In this condition it is readily accepted into the bloodstream without the necessity of being changed by the kidneys, as is required by all other sweets or carbohydrates. Like all other processed foods, the real value of the sugar has been taken out, or lessened.

In studying honey we find *Substances that can be determined quantitatively* as follows: Water 17.70. Levulose (fruit sugar) 40.50 — Dextrose (grape sugar) 34.02. Sucrose (cane sugar) 1.90. Ash mineral matter: manganese, magnesium, phosphorus, etc. 0.18. Total 95.81.

Substances difficult or impossible to determine quantitatively: Pollen grains — Beeswax — Albuminoids (proteins) — Formic Acid — Malic Acid — Chlorophyll — decomposition products — Yellow pigments — Carotin (a plant pigment) — Xanthophyll (a plant pigment) — Dark pigments of unknown composition.

*Substances known to be present, but difficult to demonstrate*s
Enzymes: Invertase (converts surose to dextrose and levulose)

Diatase (converts starch to maltose)
Catalase (decomposes hydrogen perovide)
Inulase (converts inulin to levulose)
Aromatic bodies — terpens, aldehydes, etc.
Higher alcohols — mannitol, dulcitol, etc.
Rare sugars, melezitose, etc.

In studying the above and comparing the same with commercial sugar, it is readily seen the great advantage honey has in preference to common sugar. Also the medicinal value of honey is worth while considering. The dextrose, or energy sugar contained in honey is well recognized among athletes as enabling the athlete to withstand the strain of great exertion and stress required. As stated before, the honey being partly predigested is easily assimilated into the system even by the weakest stomachs of the invalid, or even babies. Honey also has its place among the remedies for colds, etc. Many cough mixtures use honey in their composition, and honey with the juice of lemons is one of the finest remedies for a cold or a sore throat and is certainly to be preferred to some of the questionable quack nostrums put out on the market. Germs are unable to remain alive in honey with probably the exception of Bacillus larvae of American Foul Brood. Also in the kitchen, as a substitute for sugar, honey can be used in very many of the pastry recipes, etc.

CHAPTER VIII

Hiving Stray Swarms. Trouble with Neighbors. The Bee Tree. Taking Bees from Buildings. Getting Rid of Surplus Drones. Remedy for Drone Layers. The Stinger of the Bee. American Foul Brood, its Remedy. Resisting Queens. Moth Mitler, etc.

The catching and hiving of bees is not difficult but requires sighted aid since it is necessary to find the queens. First, before the bees vacate a hive they fill themselves with honey and, being full, are, like bees vacate a hive they fill themselves with honey and, being full, are, like all of us, satisfied and with careful handling can be safely hived. If the swarm is located on a tree, bush or shrub and near the hives, it may perhaps be possible to find out from which hive the bees have absconded. This generally is not very difficult. By examining the front of the hives it is easy to see what was formerly a strong colony by the activity at the entrance being weaker. When satisfied as to which is the hive, open the hive and it will usually contain frames containing queen cells, from perhaps one to a dozen or more. If you wish to return the swarm to the same hive, I suggest you cut off all queen cells, except perhaps one, the biggest and best looking cell. This is as a precaution if the queen in the swarm is an old queen. In the meantime you can place the frame with the queen cell aside or in a nucleus until you determine what you wish to do. When the queen cells have all been removed the swarm can be replaced in the hive, being sure the queen is given empty frames or foundation for laying space. Place the frames containing brood and honey above the brood chamber. Generally this will prevent the bees from leaving again. When you examine the hive after they have settled down you can find the queen and if she is an old queen and you wish to requeen, you simply return the frame with queen cell and destroy the queen. The bees then will ordinarily go right back to work again.

The loss of a swarm is a serious matter for it consists of field bees and their loss means little surplus, if any, from the hive they vacated. If you want to increase the number of hives in your apiary, now is a good time instead of destroying the queen cells from which the swarm has emerged. Place two or three frames, with one or more queen cells attached, in the center of another hive, or nucleus hive, being sure to furnish same with plenty of food. If in a regular hive, fill the remaining space with frames of comb, or foundation. It is well to reduce the entrance of these hives to three or four inches and be careful to watch these closely for robber bees from the other hives especially if there is a dearth in the honey flow.

In taking the swarm from a tree, take the garden pruning shears and on which the bees are attached with the left hand, with a sharp saw cut cut away the small twigs outside of the cluster. Then, holding the branch the limb above, being very careful not to disturb the bees; come down from the ladder and place swarm either in front of the hive or place an empty super on top of the hive and place swarm quietly inside. With the smoker, the bees can be slowly driven down below, the empty super removed, and top cover replaced.

If the swarm should be in a difficult place, like a bush or shrub, where you cannot place an empty hive, then place a hive containing frames as near as possible and take a frame one at a time and hold under the cluster. The bees will soon take to the comb and when fairly filled, take another until most of the bees are removed and place in the hive. It is a simple matter to know when the queen is safely in the hive by the contented action of the bees. They remain quiet, fanning. When the bees are nearly all in the hive it can be removed to the apiary. They can remain in the hive as an added colony or, if you wish to return it to the old hive as with the swarm from the tree, place the hive on top of the old hive and jounce the bees off the frames one at a time and with a little smoke, they will soon be down below.

Taking bees from hollow trees or buildings is a different proposition. If the hollow tree containing the bees should chance to be low down, near the ground, a good plan is to locate the entrance hole, then with a sharp saw cut through the tree to nearly a half. Then with brace and bit drill 3/4" holes close together on both sides of the saw cuts and with chisel cut through the holes, lifting the piece of wood from the tree, exposing the combs. Carefully remove the comb with bees, brood, etc., and place in a container. When all is secured cover well and remove to the apiary where the contents can be placed on top of an empty hive inside an empty super. If the hive contains drawn combs the bees will quickly go below, using the front entrance. Soon the queen will be laying in the new frames. When this occurs, place an inner cover on top with the center hole open. The bees will then take the honey from the old comb and the emerging bees will soon join the other bees below. When the old comb is completely empty, it can be removed and melted. Another way, and somewhat simpler, which can be applied in removing bees from buildings is to take a piece of cloth,—a feed bag opened up all around will be satisfactory. In the center of this sew a piece of wire cloth and in the center of this, fit a Porter Bee Escape. This is to permit the bees to come out only. Fit this right over the hole used by the bees. Now place a hive containing some frames of honey and brood as near the hole as possible. The bees, finding they are unable to enter, will find their way into the hive and having brood, will stay. If you can introduce a queen at the same time, so much the better. In a while all the bees will have been enticed into the hive and the emerging brood will also find its way there. Sometimes the queen will come out to go into the hive. When you find the new queen or the old one laying in the hive, the cloth can be removed and the bees will quickly enter the hole to rob all the honey and store in the new hive. The hole can then be covered up and the bees removed to the apiary. It usually requires about three weeks or a month before the job is accomplished, but it is very satisfactory.

Another problem the beekeeper has to contend with at times is too many drones and when we remember these husky loafers eat four or five times the amount the worker consumes if the honey flow is not strong it will not be long before the hive will be altogether lacking in stores. In fact, it will dwindle and die. So we see the importance of keeping the number of drones restricted. An article on this subject, written by me and printed on Page 524 of the *Ameriacn Bee Journal* in the December issue, 1942, in purport is as follows: First take a queen excluder and a drone trap, uncover the hive and select combs with no drone cells, or if this is not possible, get some drawn worker comb, or use medium foundation, properly wired, the object being to get all worker comb in the hive. Set the combs aside with the bees from the hive, leave the bees on them undisturbed. Get all the drone combs separated and by themselves. The separation of the combs requires the help of a sighted person.

Now the hive is without combs and the remaining bees may be brushed off outside. Put the drone trap at the entrance and the excluder on top. The hive is now completely empty. Put another hive body on top. Take each frame selected as satisfactory, shake off the bees off inside the top hive body. Then slip one of the selected frames quietly underneath, moving the top hive body a little to permit sufficient room to do this. Do this with all the combs selected, pushing them over in the lower body with the hive tool. Now take the other ten combs, shake off all the bees into the top super in the same way, being careful to keep the excluder in place all the time. Then cover the hive.

In the morning the workers will have entered the lower hive through the excluder and the drones will be confined to the top one. The excluder, with the top hive containing the drones can now be removed to a distance and the drones destroyed as you wish. Then the now empty hive body may be returned to the colony and ten more combs given for surplus honey.

If there was no queen with the colony, now is the time to introduce a good one, but if the colony did have a queen, she should be put back with the lower combs. Usually she is confined to some safe place while the operation of drone removal is going on. The second day the drone trap can be taken away from the front entrance and if the work has been properly done there should not be a single drone left in the hive. A decent queen will take up her job and if the queen is poor, she can be replaced. This method is simple and takes less time than it does to tell about it.

Now we come to the difficulty sometimes encountered with a colony of drone layers. When a colony of bees has been long without a queen, some of the workers will undertake to remedy this condition. How they are able to do it, I have never been able to understand. Nevertheless, it is a fact that though workers are imperfect females, they are able to lay eggs. But these are always unfertilized, and, therefore, produce only drones. When a hive is in this condition it is next to impossible to introduce a queen as they will kill the queens as fast as they are introduced and the beekeeper is at a loss what to do under these circumstances. Well, the remedy is as follows: First remove all the frames with the adhering bees from the hive, leaving the hive body empty, place the top cover on the hive and place a drone trap in front of the entrance. Then take all the frames with the bees attached about 100 feet away. Dump all the bees on the ground. While the bees are finding their way back to the hive, substitute new frames of comb or foundation to take the place of the other frames. If foundation, feed for about a week. The bees coming back to the hive will be the non-layers, the layers will be found to remain on the ground where, after a while, they can be destroyed. They seem unable to leave the ground. Now introduce a new queen in the regular way and the work is done. The frames containing the drone eggs can be distributed among the other coolnies, the bees of which will soon clean out the drone eggs. Some beekeepers simply take the frames and give a few to each of their colonies. In this way, the trouble can also be remedies. You will understand that by the first method the drones are not able to enter the old hive and if this work is done late in the afternoon or evening, the drones will be found trying to enter the hive through the drone trap and can be killed. If the job has been done right this should get rid of every drone from the hive of drone layers. This method you will find very successful.

We now come to the worst enemy of the honey bee, that of American Foul Brood. This disease can be detected readily by a sightless person because of the peculiar odor of the decaying larvae. This disease —Bacillus larvae — affects the intestines of the bees and when fed to the larvae by the nurse bees, arrests the developing of the larvae and disintegrates to form a brown, gelatinous substance, somewhat like glue with an odor as offensive. It is very important that the beekeeper learn to distinguish this. Otherwise, it will be but a short time before all the hives in the apiary are affected spelling ruin and loss. Upon examining the combs of covered brood you will find the cells affected with American Foul Brood to be sunken in, concave instead of convex as the healthy brood should be, and quite often a miniature hole in the center of the cell. This hole is made by the bees to permit the foul odor to escape from the decaying larva. Take a common match, or tooth-pick, and prod into the cell. If you find this guey substance as described, it probably is American Foul Brood. If you wish to assure yourself, cut a piece of the comb, or smear some of the substance on a piece of paper and carefully mail same to the Bureau of Entomology, Department of Agriculture, Washington, D. C. In about a week you will receive the report. After many years of experience in trying to remedy this disease, I am firmly convinced that the best and surest way is to burn up the whole of the frames after the bees have been destroyed. Then with a blow-torch, scorch all th inside of the hive body and every part the hive. Then thoroughly scrape with a sharp hive tool. If a blind man does this work it should be inspected by a sighted person to see whether all the areas have been scorched and scraped properly. The frames should be burned by throwing them into a furnace or if this is not convenient, wrap in a piece of brown paper or oilcloth, dig a hole, place therein the bundle of frames, put on some kerosene or gasoline and burn completely. Then cover well with dirt. You cannot be too careful in destroying these frames for if any bees from any adjoining hives or apiaries should get a taste of this affected honey the disease will be carried and spread.

The honey of bees affected with foul brood is not at all dangerous for human consumption but only to bees. Of course, if you use the honey in the kitchen, be very careful that none is left where the bees can get at it. This is one reason why it is risky to feed bees honey from an unknown source. Better use sugar syrup.

Another disease, known as European Foul Brood, while bad, is not nearly so difficult to treat and can be safely remedied. To determine if the hive is affected with this disease, examine the frames of the brood and larvae. If you find some of the larvae a distinct yellow color instead of a beautiful pearly white — like a yellow hen among a flock of white leghorns — you probably have a case of European Foul Brood and if some of this affected brood should have little black cpots, it will further point to this conclusion. These differences in color cannot be detected by a person without sight and is one of the items the blind beekeeper must have his sighted friends check for him constantly. You may also send this to Washington for analysis. To remedy, proceed as follows: Remove the queen for about ten days, during which time the bees will endeavor to clean out the disease. Then build up the hive with some frames of capped and uncapped brood from some other colonies. When the hive is now in a strong condition, introduce another queen—if possible, a young and vigorous one. This will generally work out very satisfactorily. However, this could not be done with American Foul Brood. With American Foul Brood, the bees are first killed with carbon bisulphide, first closing the entrance and pouring about four ounces in on the top of the frames and closing the top tightly. With the European Foul Brood, there is no need to destroy the bees.

Resisting queens: Of late years, much has been done along the lines of breeding queens capable of resisting American Foul Brood, my friend, Charlie Wraz of Vermont, being among the pioneers of these experimenters. And surely, much has been accomplished in this respect. I, for one, sincerely hope that the time will soon come when this curse of bees will be conquered. In the meantime, my advice is to get the darker, or what is more commonly called the leather-colored queens, as these seem to be stronger in breeding bees free from disease.

Be very careful to clean thoroughly any tools, etc., used while handling American Foul Breed.

Moth Miller: This insect will enter a hive and deposit her eggs when given the slightest opportunity. While the hive is strong, no need to worry, as the bees will take care of the matter themselves, but when the supers are removed preparatory to storing, it will be wise to fumigate to kill any hatched larvae, etc. Stand the supers about six full depths high on a flat surface. Then place about four ounces of carbon bisulphide in a saucer on top of the frames. Cover tightly with top and allow to remain overnight. As this is a dangerous gas to handle, keep away from fire or matches. Being heavier than air the gas descends and kills all living matter. In storing the supers over winter I suggest they be placed in a cold place, out-house, barn or garage. If there are any unhatched eggs they will not hatch in the cold. Then place a newspaper on the ground, shake some mothflakes on the paper and place the super on paper. Place a paper and mothflakes on each as you tier the supers, one on top of the other.

If one should have trouble with neighbors from the adjoining houses if in the city, I suggest you give them a sample of honey in the fall after extracting. This may ease their feelings if they should discover their beautiful wash on the clothesline discolored by a sprinkling of dark spots by the bees, especially in spring when taking their cleansing flights. Perhaps it is best not to inform them your bees are the responsible culprits. And of course, the honey was so good it couldn't possibly have been your bees.

In conclusion, my very best wishes for success in an industry which will prove more interesting and fascinating as the seasons come and go, and to realize the wonderful work of the Great Creator in blessing mankind with this valuable insect — the Honey-bee.

Beekeeping For the Blind

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